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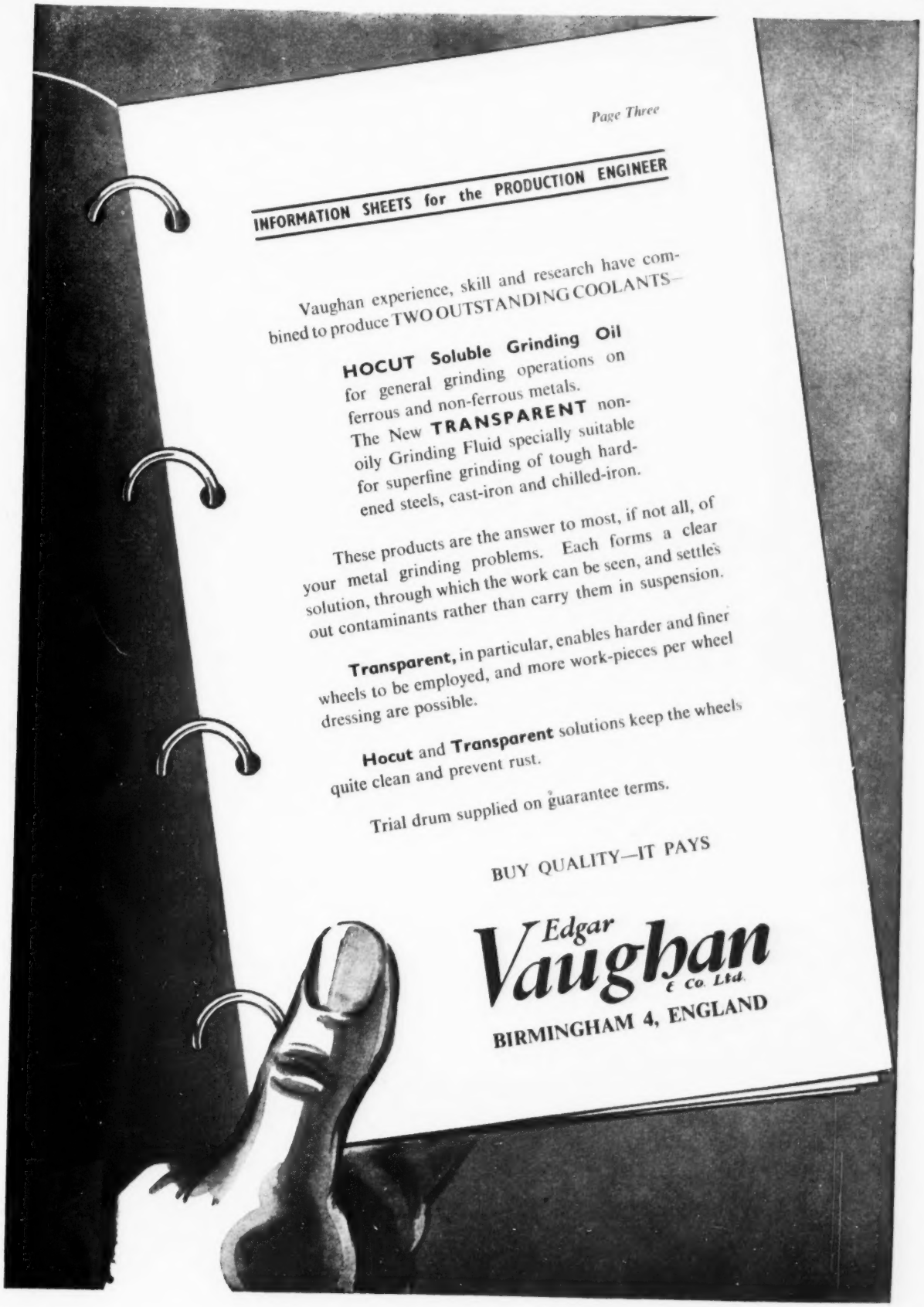
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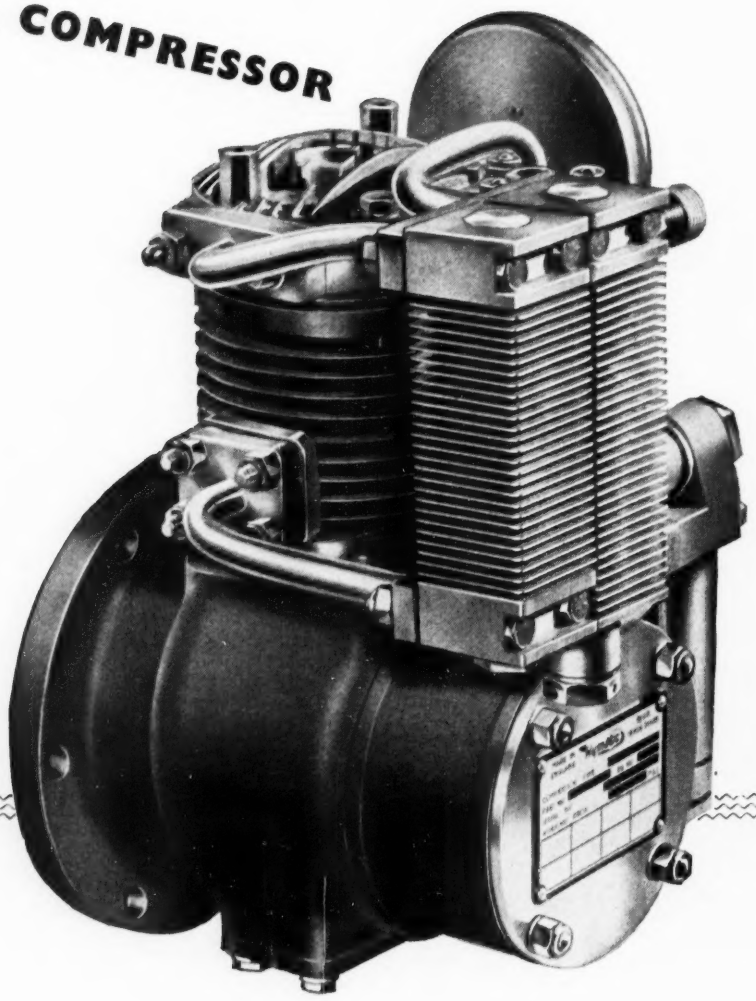

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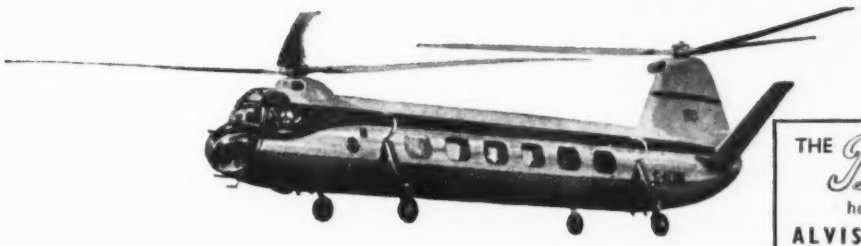

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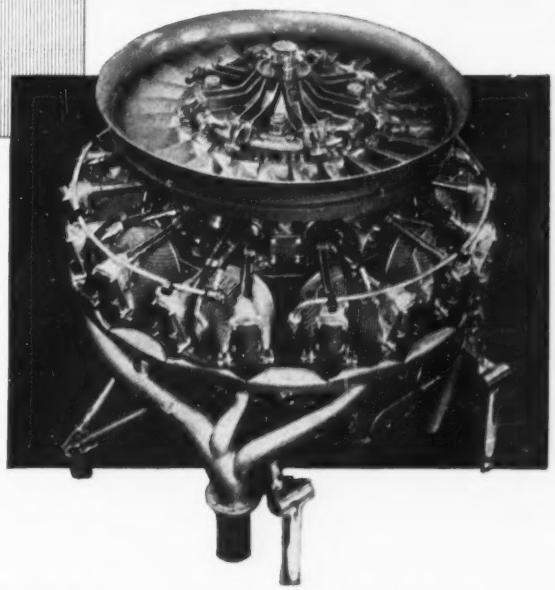

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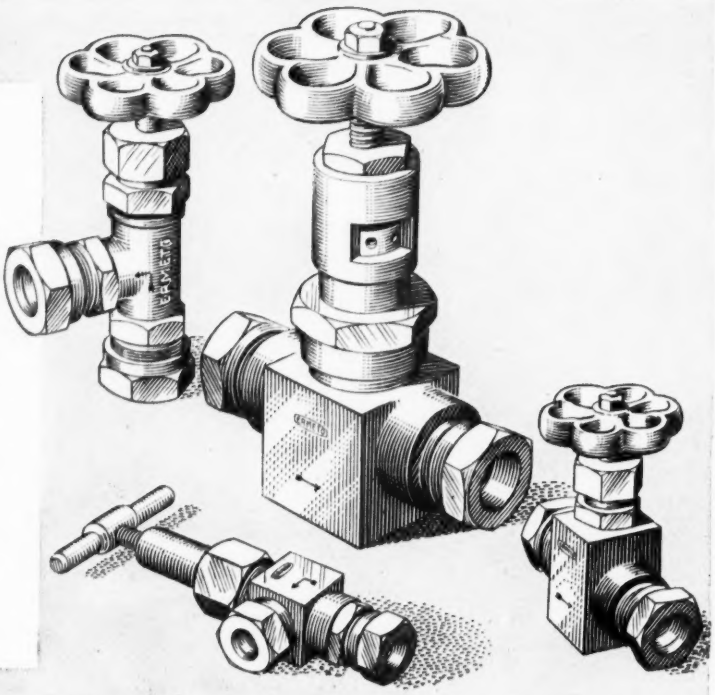

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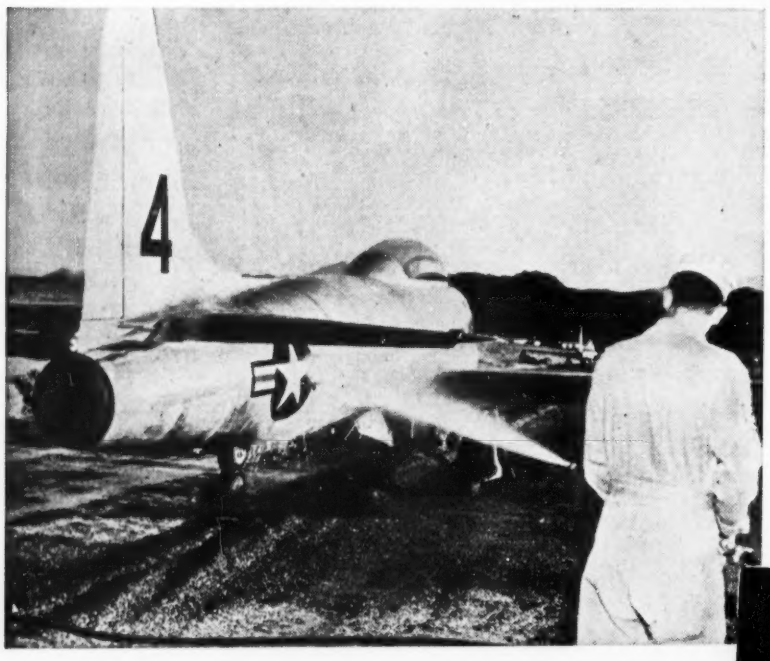

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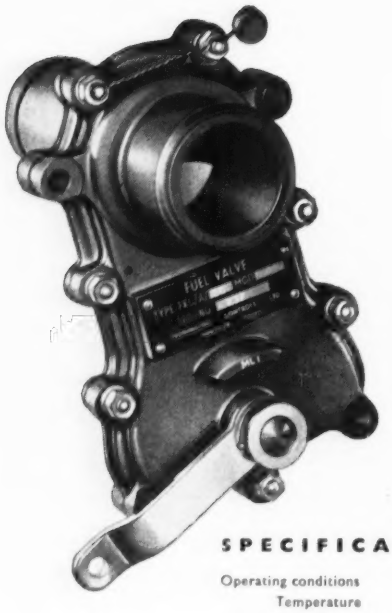

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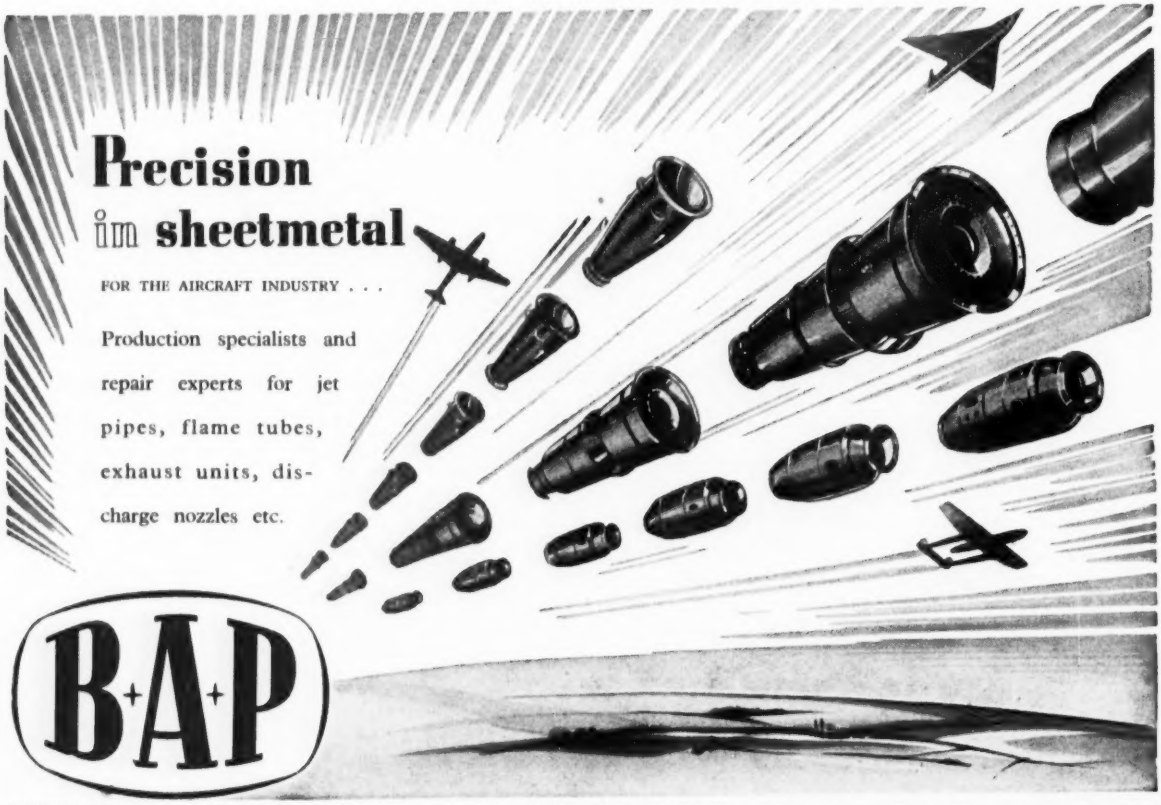
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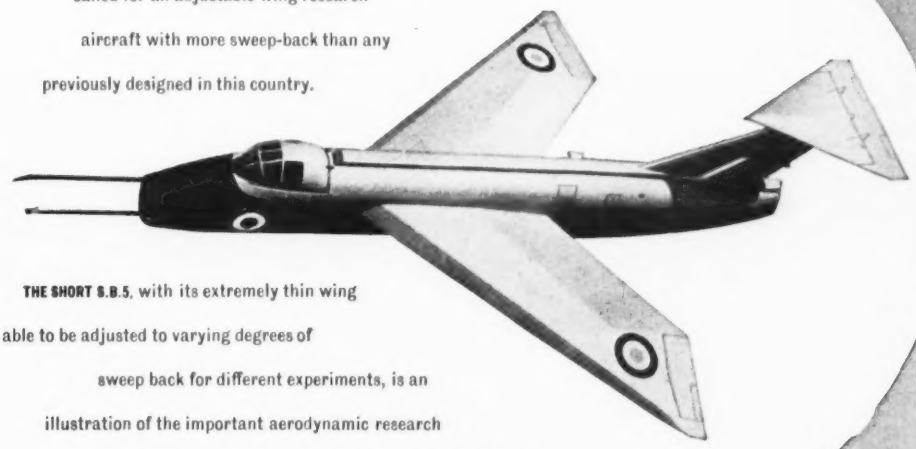

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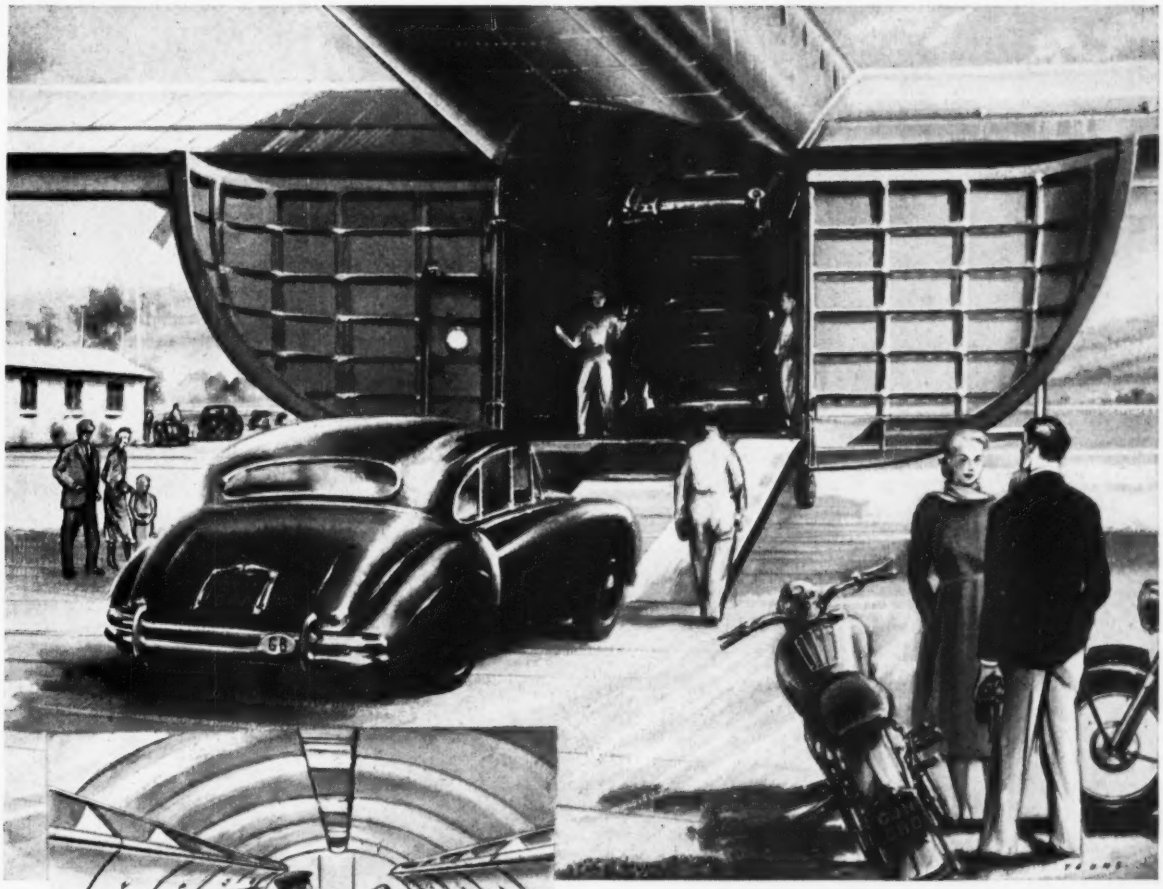

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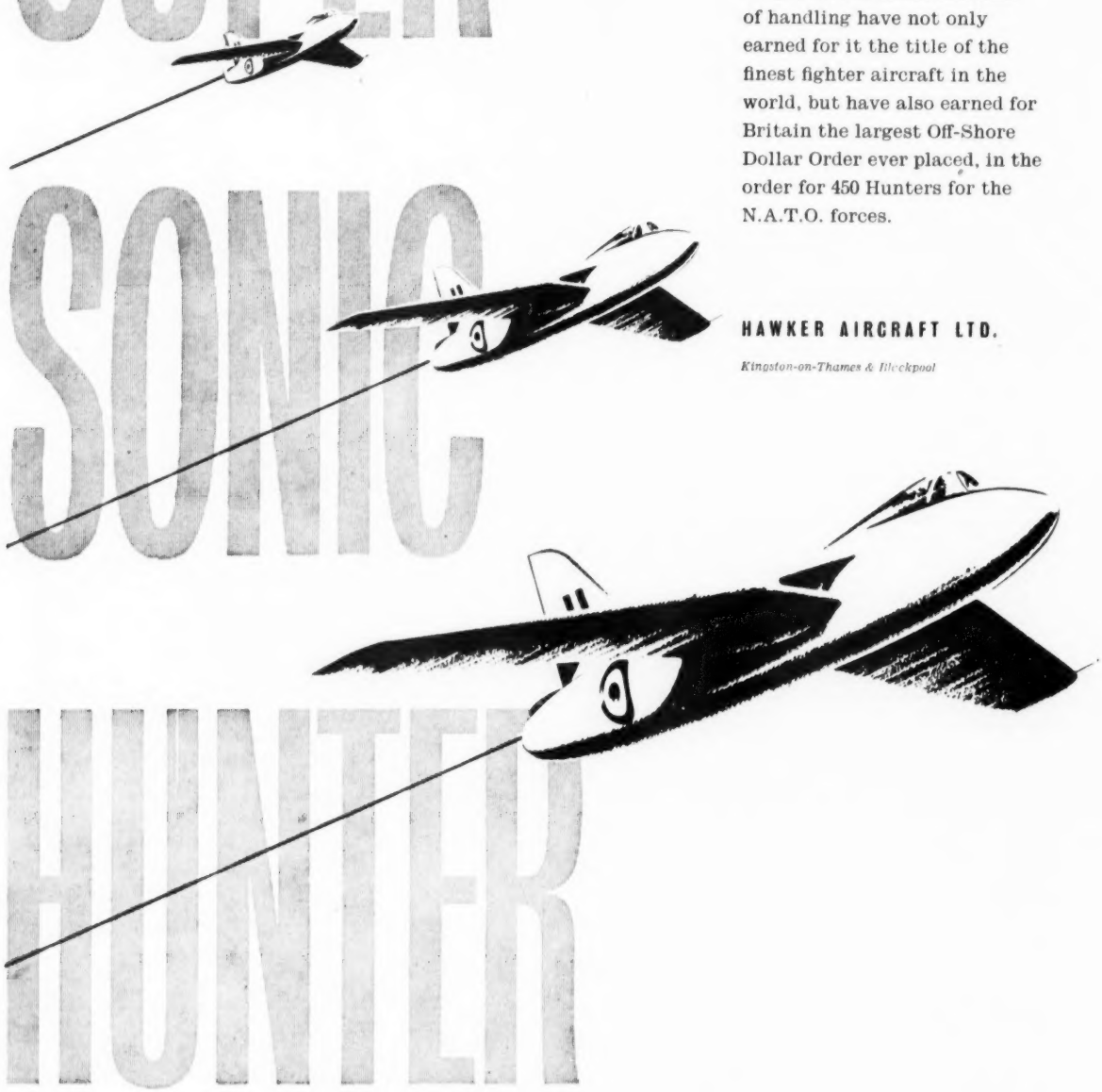

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EDITOR
MAURICE A. SMITH, D.F.C.

ASSISTANT EDITOR
H. F. KING, M.B.E.

ART EDITOR
JOHN YOXALL

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Smoothness *all* the way

THERE are several stages in the process of winning the individual over to air travel, and the true test-case is on those journeys for which there is the alternative of good surface transportation. In the first place there is the publicity to acquaint him with the possibilities of the air; next the further advertising of specific routes, the operating companies concerned, their aircraft and the times and costs involved. Somewhat later on, when the customer is sampling airline travel for the first time, his treatment and the impressions he forms will, we believe, have a much greater influence than anything else upon his decision to fly again on other occasions.

As more and more people use the airlines it is almost inevitable that much of the personal touch should be lost during the ground handling, although it can and has been preserved in the aircraft—particularly in British aircraft. There is little doubt that to cut down on the staff and facilities which provide those small things that result in individual attention, personal comfort, and peace of mind, is a false kind of economy.

Selling points of air travel are speed, comfort, convenience and cleanliness, of which the third is now letting down the others badly, particularly if speed is considered only in terms of the air journey and the proceedings on the ground are placed under the heading of convenience. Much has been achieved by the British Corporations, but much more could be done to add to convenience and thus improve the passenger's opinion of the line concerned and air travel in general. Every satisfied customer becomes a valuable salesman or saleswoman; conversely, the disgruntled ones—who usually have the most to say—may put off dozens of others.

Long-distance services pose rather different reception and departure problems from those of the frequent, short Continental and inter-city routes. For all, however, the coach ride (the whole way or nothing) and the early reporting create a bad impression, and the five-shilling fare ("in English money, please") aggravates the position. (The M.C.A.'s recent decision to abandon the five-shilling head tax will be well received.)

Again, it should be possible to cut down on the long wait which follows passage through Customs and immigration prior to departure, and a perennial irritation is the not infrequent further delay *for which no explanation is forthcoming*. This sort of thing is unquestionably holding back air travel. We have purposely omitted the official paperwork and Customs, over which the airlines have little control.

Following discussions with a number of people who have frequently or occasionally travelled by air at their own personal expense, we would propose for consideration two other possibilities for improvement under the "convenience" heading. First, we would suggest an all-in ticket costing, say, £1 more than the standard fare and which would exempt the passenger from the fiddling 5s. road-fare, would provide a reserved seat in the aircraft (and so avoid the round-up and scramble at the gate), and cover the cost—particularly in London—of routing a limousine to three or four strategic points to suit the convenience of passengers. This vehicle should have sufficient speed to take advantage of the de-controlled by-pass roads on the way to the airports, and sufficient acceleration to pass slow-moving commercial vehicles. As we have personally observed in the coaches, there are few things that cause more annoyance than crawling at 20 m.p.h. behind a heavy lorry on the long drive into London and then jolting even more slowly through the denser traffic to Victoria or Waterloo (no intermediate stop is allowed), particularly if one's final destination is Kensington or the West End.

A second suggestion for London Airport is the provision of a first-class airport hotel for early-departing, late-arriving or delayed travellers. Passengers due to take off at 9 a.m. could enjoy a night's sleep in comfort and, after breakfast at normal time, could proceed to the departure hall much as they would go to the platform from the railway station hotel. Many would prefer this to rising at 5 a.m. in order to report at the town terminal at 6.30, to get into the bus at 7, to be driven to the airport by 8, to wait in the lounge at 8.30, and to embark—perhaps—at 8.50. Once airborne, to arrive at the airports of Rome, Geneva or elsewhere in less time than it would take to retrace one's steps through formalities, bus ride and town terminal, is some compensation; but not enough.

THE GLIDING CHAMPIONSHIPS

Mixed Weather for the National Contests at Great Hucklow

Geoffrey Stephenson and his wife survey the slope. He scored high marks from the outset.

AS has already been recorded, the National Gliding Championships began at the site of the Derbyshire and Lancashire Gliding Club at Great Hucklow, Derbyshire, on Sunday, July 26th. The contest ended on Monday last. This is the eighth Championship meeting at Great Hucklow; contests were held here in 1949, 1950 and 1951, but there was none last year, owing to the fact that the World Championships were held in Madrid. Philip Wills' victory in Spain, and the choice of Great Hucklow as the site for the 1954 World Championships, have lent extra interest to this year's meeting.

The entries in the Individual Class numbered nine (two Skys, three Olympias, one each of Skylark, Kite II, Petrel and Weihe), while the Team Class entries numbered 25 (one Sky, twelve Olympias, eight Sedbergh two-seaters and one each of Kite IIa, Gull IV, Prefect and Weihe).

Individual and Class gliders had to be flown each day by the one pilot and, to reduce pilot fatigue, efficient team work by the retrieving crew was essential. The trailers and towing vehicles were usually driven away toward the goal before the glider pilot left, so that there should be minimum delay between the landing and beginning the retrieve. Telephone messages from pilot and crew to the control room brought pilot and retrievers into contact.

No hangar space was available for competing gliders and most were de-rigged and put into trailers each night; but several of the Sedberghs were picketed down each night to save the labour of de-rigging. The pilots and crews lived in caravans or tents nearby, or in local hotels, while the large numbers of winch drivers and ground organizers were billeted in the club premises at Camphill Farm.

At the briefing meeting each morning one of three tasks was set by the organizers and a meteorological forecast was given to help the pilots to plan their flights. Launching began after briefing and gliders were despatched in a sequence drawn by lot and published in advance. If the wind was from a southerly or westerly quarter, and above about 15 m.p.h., a glider could hill-soar over Bradwell Edge after a winch launch. Four winch wires were in use and as many as 25 gliders were flying over the ridge on occasions, but pilots hoped to be able to escape from the crowd in a convenient thermal and to climb to the pleasant solitude of the clouds as soon as possible.

The Sailplanes. The Slingsby Skylark aroused considerable interest. In flight the narrow-chord wings made it conspicuous and the assembly of the three-piece wing (instead of the usual two) was watched with interest. The high take-off speed, due to a wing loading of 5.5 lb/sq ft, and the lack of a wheel, made ground handling and launching awkward; but in flight the performance was obviously first-class. The Kite II, modified by Frank Irving, showed three dive brakes on each wing—valuable approach-controls in an area where stone walls abound.

Three of the R.A.F. gliders were equipped with radio for contact between pilot and trailer crew, and the Cambridge University Olympia was similarly provided with Pye equipment. The total-energy, venturi-type variometers were seen on most gliders, while some R.A.F. Sedberghs were fitted with a new contacting variometer which caused green or red lights to flash at a rate proportional to the rate of climb or sink.

Sunday, July 26th.—At the pilots' briefing meeting in the morning, the clerk of the course, Basil Meads, introduced the Parliamentary Secretary to the Ministry of Civil Aviation, Mr. John Profumo, M.P. Claiming that he had never before made a speech so early in the morning, Mr. Profumo commended Philip Wills' great achievement in Spain last year as a forerunner to the achievements of the new Elizabethan age. He said that he had a special and extra interest in gliding because it afforded opportunities for initiative, enterprise and courage without which no community could flourish. He then declared the Championship meeting open.

C. E. Wallington, the Meteorological Office forecaster on duty for the week, then presented the weather picture. A fresh W.S.W. wind with good cumulus clouds should enable pilots to reach the coast and most pilots declared their goals accordingly. Four winches were soon launching gliders at a rate of nearly 20 an hour, and the wind direction enabled them to soar over Bradwell Edge. Periodically, as a sunny patch brought thermals, groups of sailplanes were seen climbing steadily to cloudbase; but the wind soon swept the circling gliders downwind and their pilots quickly had to decide whether to return to the hill or to "burn their boats" and begin their journey.

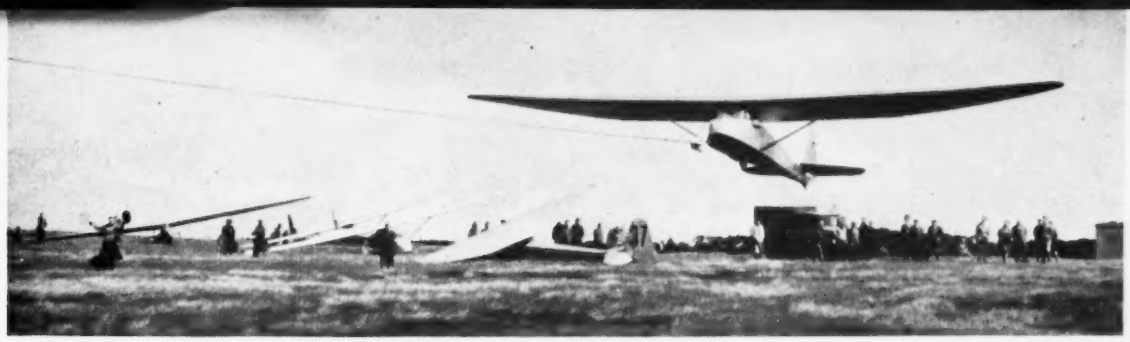
When the telephone messages arrived from the competitors who had landed it was found that 15 of the 32 who got away had reached their goals. Maximum points were scored by Peter Bisgood of the Empire Test Pilots' School (Sky) and Lt. Col. A. J. Deane-Drummond (Skylark) who both reached Whitby, 94 miles away. Other goals which had been reached included Speeton, near Flamborough Head, and Donna Nook, a disused airfield on the Lincolnshire coast. Altogether 1,847 miles of track were covered by 32 pilots in one hundred hours' flying. Cloudbase was as high as 5,500ft above sea level, so that little cloud-flying proved necessary. Several pilots reached the coast very quickly; with the aid of the fresh wind, Philip Wills had a ground speed of over 50 m.p.h. Several of the clouds built up to thundercloud-size late in the day, so that many of the retrievers came back to Great Hucklow amid showers.

Slight damage was incurred by two gliders on landing and R. C. Pick's Petrel was lucky to escape damage when, in its trailer, it was bowled over in a collision with a Rotherham trolley-bus. The day ended with Deane-Drummond in the lead in the Individual class (a good start to competition flying in the new Slingsby Skylark) and with the E.T.P.S. Sky at the head of the Team list.

Monday, July 27th.—The organizers had again set as a task the flight to a goal of the pilot's choosing. The wind was westerly and nearly 30 kt but clouds covered much of the sky. Several pilots managed to get away from the site before a lunch-time rainstorm which forced down every slope-soaring glider.

When the rain stopped the sky was thick with massive cumulo-nimbus. One of the first gliders to be launched was the open-

(Left) Lt. Col. A. J. Deane-Drummond in the new Slingsby Skylark; by the end of the first day's flying he was leading in the Individual class. (Right) World Champion Philip Wills in his Sky; he was lying third after five days.



The R.A.F.G.S.A. Sedbergh T.21B flown by Cpls. L. Simpson and G. Bacon is winched off. (Below) Mr. John Profumo, Parliamentary Secretary to the M.C.A., in unparliamentary dress; with him (left) is Louis Slater. In the next picture, downwards, are F/L. Alan Piggott and A.T.C. Sgt. J. Whatley, photographed at Grimsby with the Sedbergh after the goal-flight on which they reached 17,000ft.

cockpit Sedbergh two-seater flown by F/L. Alan Piggott, chief instructor at the A.T.C. Home Command Gliding School at Detling, Kent, with an A.T.C. cadet, Sgt. D. B. Whatley, as passenger. They managed to enter one of these large clouds and climbed inside it to 17,000ft above sea level—a new British gain-of-height record for two-seater gliders. They encountered rain, sleet and hail and the estimated temperature at 17,000ft was −4 deg F. Piggott and his passenger reached their goal at Grimsby, 70 miles from Great Hucklow, at the comfortable height of 9,000ft. This flight gave their Sedbergh the lead in the Team class, while Geoffrey Stephenson, who reached his goal at Scampton (48 miles) by climbing to 14,800ft above sea level in a similar type of cloud, took the lead in the Individual class. Only five other pilots added to their scores.

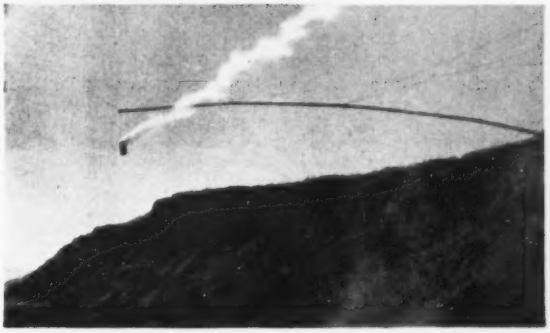
Tuesday, July 28th.—The task on this day was a race to Boston, 73 miles away and almost downwind. Marks would be proportional to the distance covered, but those reaching Boston would receive a bonus depending on their speed. Ground observers were posted to time the starts (flights across a line marked on the ground) and also the landings at Boston. The weather forecast gave a 20 kt westerly wind with good cumulus developing to 8,000ft; but a warning was given that high cloud might cut off the sunshine and cause decay early in the afternoon.

Launches proceeded rapidly and hill-soaring was possible all day, but only 13 of the 32 starters managed to get enough height to leave the hills of Derbyshire. The considerable cloud-cover lasted until 6 p.m. and by then the sun was too weak to produce thermals. Two pilots reached Boston: Geoffrey Stephenson averaged 46 m.p.h. and took a considerable lead in the Individual class, while Dan Smith, also of the London Gliding Club and flying the Olympia (which he owns jointly with Stephenson) averaged 33 m.p.h. and rose to second place in the Individual class. Philip Wills covered 29 miles and Deane-Drummond 31.

Both of the successful pilots had struggled hard to maintain height. Each had managed to reach cloudbase, 2,000ft above the site, soon after crossing the starting line and had climbed in cloud a further 5,000ft. Over Nottinghamshire and Lincolnshire the active cumulus formed over the Pennines were decaying and spreading across the sky, so that active clouds were far apart. Near Newark, Dan Smith circled his Olympia desperately in air rising only just fast enough to maintain his height. He was able to reach Boston but, unable to bear the sight of faster gliders arriving, went shopping in Boston. On his return to the airfield he found that only Stephenson had arrived and that he had won the daily prize for the *slowest* recorded time!

In the Team class the A.T.C. Sedbergh, which on the previous day had established the new height record, covered 16 miles in the hands of the alternate pilot, F/O. E. J. Meddings, and retained first place. The next two places were also held by R.A.F. entries, the E.T.P.S. Sky and the 2nd T.A.F. Weihe.

(Later news is given overleaf)



(Right) How Imperial College Met. Department tested airflow over the ridge. (Below) John Cotton, at 18 the youngest competitor, about to leave on his 84-mile flight to Speeton.

FROM ALL QUARTERS

LIGHT RELIEF: Something—or somebody—amused the Duke of Edinburgh and a party of Cranwell Cadets during the formation aerobatics which followed the Royal visitor's inspection of the passing-out parade last week. (An account and pictures appear on page 183).

Mr. John Brancker joins I.A.T.A.

CHANGES in the day-to-day administration of the traffic conferences in which international airline rates and fares are worked out, and the appointment of Mr. John Brancker of B.O.A.C. as traffic director, were announced last week by the International Air Transport Association in Montreal. Mr. Brancker, who has been general manager, international affairs, of B.O.A.C. since 1951, relinquishes his post by agreement with the Corporation.

The I.A.T.A. executive committee have created a new traffic advisory committee to give more concentrated attention to the growing volume of traffic work. With headquarters in Montreal, Mr. Brancker will be responsible for the supervision of all I.A.T.A. traffic activities, direction of conferences, preparation of their agenda, and for continued supervision designed to enable the conferences to reach decisions in the shortest possible time. The basic principle that new rate structures must be unanimously approved by the airlines concerned remains unchanged.

To his new appointment, which took effect on August 1st, Mr. Brancker brings a wealth of air-transport experience. He joined Imperial Airways in 1929 and has held important traffic and managerial posts in that company and its successor, B.O.A.C., and their affiliates, in many parts of the world, and has served as chairman of the former I.A.T.A. traffic committee. Aged 43, he is a son of the founder of I.A.T.A., the late Major-General Sir W. Sefton Brancker, who was the first Director of Civil Aviation in the United Kingdom after World War I.

No Gnats?

A REFERENCE to the Folland Gnat project was made in the Commons on July 29th, when Mr. George Ward, Under-Secretary for Air, was asked by Mr. E. A. A. Shackleton (Lab., Preston South) to initiate the placing of a development contract for a light fighter of this type. During a defence debate on the same day, Mr. Arthur Henderson (Lab., Rowley Regis and Tipton) said he had been informed that 900 Gnats could be provided for £6m, as compared with 215 Hunters or Swifts.

Mr. Ward said that the Air Ministry and the M.o.S. had for some time been giving careful consideration to the potentialities of a lightweight type of fighter; but from information available from the designers of the Gnat, its performance and fighting qualities as at present envisaged would seem unlikely to meet essential R.A.F. specifications.

Mr. Shackleton said that as the designers of the Gnat claimed a performance comparable with that of other existing types, and as these were unlikely to be available for NATO countries in sufficient numbers, it did seem desirable to place a development contract for a prototype Gnat.

Mr. Ward said that to produce a satisfactory engine for the Gnat would involve considerable expenditure and would take some years. Even then the performance would only be similar to that of aircraft now available. The question about NATO procurement was one for the Minister of Supply.

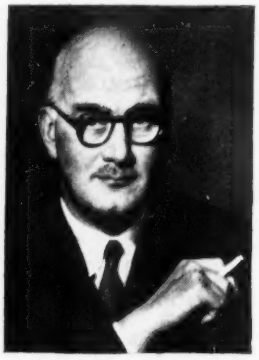
A.Cdre. A. V. Harvey (Con., Macclesfield) nevertheless felt that there might be a requirement from NATO countries for this type; he suggested that engines might be made in France to overcome the difficulty—and, incidentally, encourage a firm showing great initiative.

Mr. Arthur Henderson asked what was the difference between the performance of the Gnat and the Hunter as regards altitude and speed. To this Mr. Ward replied: "Not very marked."

The prototype Gnat, now under construction, is likely to be powered initially with the Armstrong Siddeley Viper (a detailed description of which, incidentally, appears in this issue). In a leading article on May 15th, *Flight* said: "It would be regrettable if the light fighter concept were to be dismissed because of the many other costly military commitments. . . . In fact, it might help [through "offshore" sales abroad] to alleviate those very financial problems which are now influencing its development."

Major Sir Hew Kilner

IT is with deep regret that *Flight* has to record the death of Major Sir Hew Kilner, M.C., until recently a director of Vickers, Ltd., and Vickers-Armstrongs, Ltd. He died in hospital at Weybridge last Sunday, August 2nd, at the age of 60.



Maj. Sir Hew Kilner

As recorded in an appreciation which appeared in *Flight* on July 10th, on the occasion of his retirement due to ill-health, Sir Hew Kilner joined Vickers-Armstrongs in 1930, on leaving the Army. In 1940 he became general manager of Vickers' aircraft section and from then till his retirement devoted his energies to aircraft production. A member of the company wrote: "to Sir Hew must be given most of the credit for organizing and leading a team which has successfully produced Spitfires, Wellingtons, Vikings, Valettas, Varsities, Attackers and now Swifts, Viscounts and Valiants . . . For the company to whom he has given such signal service, his retirement from active work is a severe loss both to his colleagues and to all those who worked under him; the aircraft industry has also lost an active, kindly and energetic supporter." These words were written only a few weeks before his death.

In recognition of his services to the nation Sir Hew was knighted in 1947.

Comet 2s for Air France and B.O.A.C.

FOLLOWING the experience gained during training and proving operations with the Comet 1a (three of which, ordered last year, were recently delivered) prior to its introduction into service this month, Air France has now signed a contract for three Comet 2s. These are to be delivered early in 1955, and will be 44-seat versions. With an all-up weight of 120,000 lb, the series 2 machines will operate stage lengths greater than 2,000 miles with capacity payload of 13,500 lb.

It can also be stated that the company is interested in the Comet 3, for delivery following the series 2s. The 58-76 seat series 3 will have a capacity payload of up to 20,000 lb on 2,600-mile stage lengths, and an all-up weight of 145,000 lb.

Other Comet news is that a Comet 1 fitted with Rolls-Royce Avons (which will power the Comet 2s) was flown by B.O.A.C.'s operational development unit last week for the first time, from London Airport. Later this year the corporation will receive its first Comet 2.

Avon-Sabre Flies

THE first Australian-built North American Sabre, adapted for the Rolls-Royce Avon turbojet, made a successful first test flight on August 3rd. The pilot was F/L. W. H. Scott, R.A.A.F. All-round performance should be considerably superior to that of current operational Sabres, and the intended armament is a number of 30 mm. guns.

Prestwick Pioneers for the R.A.F.

THE first of a batch of Prestwick Pioneers (Alvis Leonides) for service with the R.A.F. was due to be accepted by Air Marshal Sir Robert Jones (Controller of Engineering and Equipment) at the Prestwick factory of Scottish Aviation, Ltd., last Friday. Capable of taking off in 75 yd and of landing in 66 yd, the Pioneer has been used as a half-scale prototype for the twin-engined Twin Pioneer, which will have take-off and landing performances of the same order while carrying 16 passengers or their equivalent weight in freight.

World Model Championships at Cranfield

REPRESENTATIVES of the U.S.A. were successful in both the power and rubber-driven sections of the 1953 world championships for model aircraft, held at the College of Aeronautics, Cranfield, last Sunday and Monday. The F.N.A.F.O.M. Trophy for the best individual performance in the power class was won by Dave Kneeland, a member of the U.S. team, which went on to win the Franjo Kluz Trophy for the best team performance. The Wakefield Cup for rubber-driven models went to J. Foster, and the corresponding team award, the F.N.A. Trophy, went also to the U.S. team. Runner-up in both sections was the British team, with best individual performances from G. Fuller (power) and H. O'Donnel (rubber).

The R.R.E.

THE Minister of Supply, Mr. Duncan Sandys, stated to the House of Commons on July 28th that he had been reviewing the functions of the two Ministry of Supply electronic experimental stations at Malvern, one of which was primarily engaged on radar research for the Army and the other for the R.A.F. and Fleet Air Arm. As a result, he had come to the conclusion that it was desirable to integrate more closely all research activities in this field and to ensure a more rapid interchange of ideas and technical information. With this object, he had decided to amalgamate these two stations and so create at Malvern a combined organization, working for all three Services; it would be known as the Radar Research Establishment as from September 1st.

It was later announced that the director will be Mr. W. J. Richards, C.B.E., B.Sc., who up to now has been chief superintendent of the Telecommunications Research Establishment, one of the two Malvern organizations. Mr. Richards, who is 50 years of age, joined the Royal Aircraft Establishment, Farnborough, in 1925, and was subsequently head of the Instrument and Photographic Department. In 1942 he was appointed Deputy Director of Scientific Research (Armaments) at the Ministry of Aircraft Production, a post which he held until he went to T.R.E. in 1946.

Exercise Momentum

AS we briefly recorded last week, this year's major United Kingdom air defence exercise, under the codeword "Momentum", will take place between Friday, August 14th, and Sunday, August 23rd. Its purpose will be to exercise the air defences in interception of high-level and low-level attacks on targets in this country and against coastal convoys. The exercise, which will cover most of the United Kingdom and some coastal areas of Northern Ireland, will be divided into three phases: 2100 hr August 14th until 1800 hr August 16th; 1000 hr August 19th until 0500 hr August 20th; and 2100 hr August 21st until 1800 hr August 23rd.

Defending aircraft will be drawn from the regular and auxiliary squadrons of Fighter Command and R.A.F. squadrons of the 2nd Allied Tactical Air Force. The 2nd A.T.A.F. aircraft—Sabres, Venoms and Meteor N.F. 11s—will move from Germany to operate from bases in this country. Regular and Territorial Army anti-aircraft units and the Fighter Command control and reporting organization, including the R.Aux.A.F. Fighter Control units and the R.O.C., will also take part.

The United Kingdom defences will be under the A.O.C-in-C. Fighter Command, Air Marshal Sir Dermot Boyle.

The attacking forces will include aircraft of R.A.F. Bomber, Coastal and Flying Training Commands, the Royal Navy, Allied Air Forces Central Europe (2nd and 4th A.T.A.F.), the 3rd Air Force U.S.A.F., and the 7th Air Division U.S.A.F. A note on Naval participation appears on page 183.

A directing staff, headed by A.V-M. L. F. Sinclair, Commandant of the School of Land/Air Warfare, will be located at H.Q., Fighter Command.

G. H. Stephenson (Sky), Individual winner of the Gliding Championships.

National Gliding Championship Winners

GEOFFREY STEPHENSON (Sky) was provisionally announced as the Individual winner of the National Gliding Championships which concluded last Monday, with the Empire Test Pilots School's Sky heading the Team class.

The story of the first three days is told on pages 158-159 by Alan Yates—who, incidentally, with G. Nixon, finished second in the Team class. Of the fourth day, the Wednesday, he reports, there was heavy cloud, at briefing the forecaster warned that the start would be hardest but that instability above about 6,000ft would help those who got as high. The task was given as a flight in the direction 113° to Newark, King's Lynn and Lowestoft: there was no goal and each mile would earn marks.

The wind was still westerly, but so light that hill soaring was only just possible. Occasionally patches of sunlight appeared; but, when the last competitor was launched at 1.30 p.m., the twenty gliders still airborne were all less than 1,000ft above the site. Wills was first away; he drifted eastwards, circling carefully but climbing very slowly under an overcast sky. Yates, flying an Olympia, also climbed to 4,000ft above sea level and, gliding downwind in dead air, cleared the hills and passed Chesterfield. Twice, over industrial plants, the warmth from chimneys produced weak therma's and his flight ended at Kneesall, 33 miles from the start, in a small field containing twelve cows and a horse.

Stephenson and Wills both landed within a mile or two and sixteen other competitors exceeded the 15-mile minimum. The marking system gave Stephenson and Yates the full 100 marks for the day and at the end of four days the leaders were Stephenson in the Individual class with 342 points, and Yates and Nixon in the Team class with 192.

The detailed story of the remaining days of the championships will be given in these pages next week. To summarize, on Thursday the task consisted of flights to goals, mainly in East Anglia, selected by the pilots; Stephenson further increased his lead, while in the Team class the E.T.P.S. team drew ahead of Nixon and Yates. On Friday an unpromising forecast held up competitive flying. Saturday's task was a race to Rearsby (Leicester) and back, in which only Philip Wills completed the double journey; at the end of the day Stephenson led with 412 points, Smith was second with 347, and Wills came up to third place; the E.T.P.S. Sky kept its Team lead.

On Sunday the task was a 63-mile triangular flight, which only one competitor, Peter Bisgood of the E.T.P.S., completed. The final day's contest, on Bank Holiday Monday, was a flight in the direction of Lympne, which Stephenson reached, to gain a Gold Badge with Diamond, for a goal flight of over 300 k.m.

Provisional results for the championships were as follows:—

Individual Class.—1, G. H. Stephenson (Sky), 551 pts.; 2, D. A. Smith (Olympia), 454; 3, P. A. Wills (Sky), 452; 4, F. Foster (Olympia), 451.

Team Class.—1, Empire Test Pilots School (Sky—Bisgood, Dick, Rigg and Price), 414; 2, A. H. Yates and G. Nixon (Olympia), 336; 3, C. G. Dorman and S. Morison (Olympia), 288.

Rotol and British Messier Boards

AT the annual general meeting of Rotol, Ltd., held on July 24th, it was announced with regret that Sir G. Stanley White and Lord Hives had tendered their resignations from the Board, to take effect from that date. For the time being, says the company, it is not proposed to fill the vacancies created.

The Rotol Board now consists of the following: Mr. A. G. Elliott (joint managing director, Rolls-Royce), Sir W. Reginald Verdon Smith (joint managing director, Bristol Aeroplane Co., Ltd.), Mr. W. T. Gill (financial director, Rolls-Royce), Mr. A. E. Russell (technical director, Bristol), Lt.-Gen. Sir John Evetts. The last-named is managing director of Rotol, Ltd.

It is also announced that Colonel C. W. King has been appointed general works manager of Rotol, Ltd., as from August 1st.

The resignation of Lord Hives from the Board of British Messier, Ltd., has also been notified. Mr. W. T. Gill is to fill the vacancy, so that the Board now consists of Sir W. Reginald Verdon Smith, Mr. W. T. Gill, Lt.-Gen. Sir John Evetts, Mr. L. S. Armandias, and Mr. H. G. Conway.

HERE AND THERE

Practical Practice

F/L. J. L. C. WHITEMAN, an ex-R.A.A.F. pilot, flying his own Mustang, has set up a new record of 3 hr 31 min for the Tasman Sea crossing—an average speed of 402 m.p.h. The previous best time was by a Stratocruiser, which took 3 hr 43 min. F/L. Whiteman has entered his Mustang for the England to New Zealand Race next October.

Up to be Shot At

AN unusual type of towed aircraft—partly of delta and partly of orthodox plan-form—has been noticed recently in flight over Southern England. It is, in fact, the new A.S.T. target glider, a model of which was exhibited at the Paris Show (photograph, *Flight*, July 3rd). The airframe is a stressed-skin shell filled with a foam plastic compound developed by I.C.I., this method of construction simplifying repair after action. A tail braking parachute is automatically released as the wheels touch the ground.

Holiday from the House

MR. J. D. PROFUMO, Parliamentary Secretary to the Ministry of Civil Aviation, is to take part in the England to New Zealand Air Race. He will be a member of the crew of the Viscount which B.E.A. has entered in the transport handicap section. Before the war Mr. Profumo was a member of the Oxford University Air Squadron and also flew as a private owner. He was attached to an Army Co-operation flight at the beginning of the war and subsequently became a G.S.O. 1 (Air).

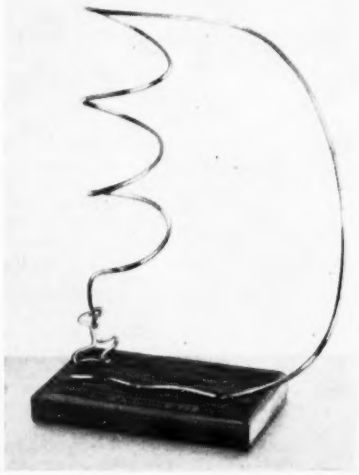
Service Aeromodellers Compete

THERE was a large entry for the United Kingdom Championships of the R.A.F. Model Aircraft Association, held at St. Athan on July 26th. Winners were Maintenance Command, with 224 points, and the runners-up were Technical Training Command (115); best individual scorer was Cpl. Burch. Other prizewinners included Sgt. McHard and Cpl. Burch (*concours d'elegance*); S. A/C. Sharples (power duration); S. A/C. Pratt (Jetex-powered models); L. A/C. Taylor (Thurston Trophy); and S. A/C. Lock (scale flying models).

BARNS-STORMER: Lt.Col. W. F. Barns with the F-86D Sabre in which he beat the World Air Speed record on July 15th. A test pilot at Edwards A.F.B., he flew at less than 100ft above the course at Salton Sea, California, which is 240ft below sea level. His mean speed was 715.7 m.p.h.; his best run, 721.35 m.p.h.

Remembering John Derry

AT a recent Washington meeting of air-minded young people from 17 nations, the late John Derry was elected "airman of the year" in recognition of his work for the advancement of supersonic flight. They are to present the award medal to his widow.



ABTRACTION: Entitled "The Unknown Q.F.I.", this imposing modern sculpture in bright copper wire is a scale model of "a monument, 300ft. high, to be erected in steel and concrete at the intersection of runways 10 and 23 at Little Rissington." S/L. J. S. Lamplugh, of No. 150 Course, presented it to C.F.S.

Calshot Folds its Wings

R.A.F. station Calshot, home of the British Schneider Trophy teams, and for 40 years a Service flying boat base, is shortly to become a maintenance unit for R.A.F. marine craft. The station's Sunderlands will leave Southampton Water and move to Plymouth and Pembroke Dock. Calshot was opened late in 1912 as a Royal Navy seaplane station and was taken over by the R.A.F. when that Service was formed in 1918.

Princesses Unaffected

WE learn that the Saunders-Roe Princess flying-boats, one of which is now at Calshot in its "Cocooned" state, to be followed by the other, are unlikely to be moved elsewhere as a result of the change in the station's function.

R.Aux.A.F. in Tattoo

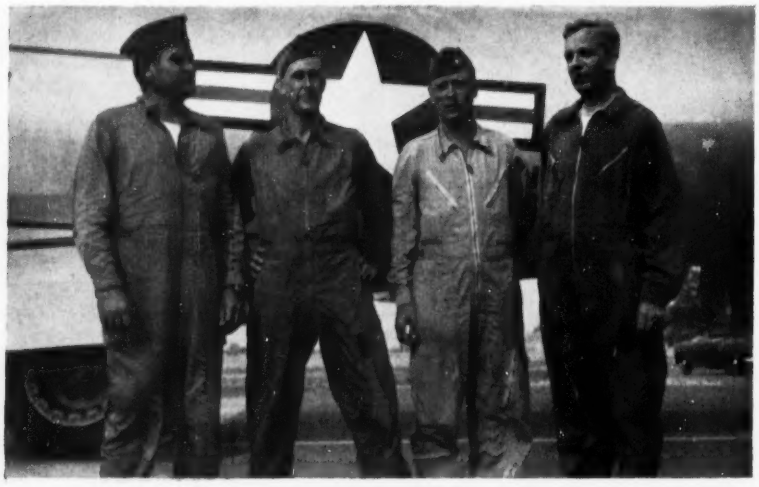
THERE will be a Royal Air Force night at the military searchlight tattoo at Chester on Friday, September 4th. The chief guest will be Air Marshal Sir Dermot A. Boyle, K.B.E., C.B., A.F.C., A.O.C.-in-C. Fighter Command, and after his arrival by helicopter in the arena there will be a fly-past by Nos. 605, 610, 611 and 613 Sqdns., R.Aux.A.F.

To Encourage Research

A NEW research studentship, valued at £500, has been established at the Imperial College of Science and Technology by the English Electric Co., Ltd. It is for the study of advanced problems in aeronautical engineering—particularly those of vibration, stability and control of aircraft at high speeds. English Electric have already established fellowships at the University of Glasgow and the College of Aeronautics at Cranfield.

A Pioneer Dies

AN early authority on powered flight, Dr. Richard von Mises, has died at his home in Boston, Mass., at the age of 70. He had retired, only a month before his death, as Professor of Aeronautics and Applied Mathematics at Harvard University. A native of Austria, he had lectured on aeronautics as early as 1913 and in 1915 designed aircraft for the Austrian Army; he flew as an army pilot in World War I. In 1945, he published *Theory of Flight*, a major work on aerodynamics.



PUDDLE-JUMPERS: Photographed at Fairford, Glos.—where their unit, the 305th Bomb Wing, shortly takes over from the 306th—are the crew of a B-47B which recently flew 3,120 miles from Maine in 4 hr 45 min. From the left: Lt.Col. J. M. Smith, Lt.Col. D. H. Frank, Maj. A. E. Dawson and civilian passenger Bern Haugland, of the Associated Press.

1917

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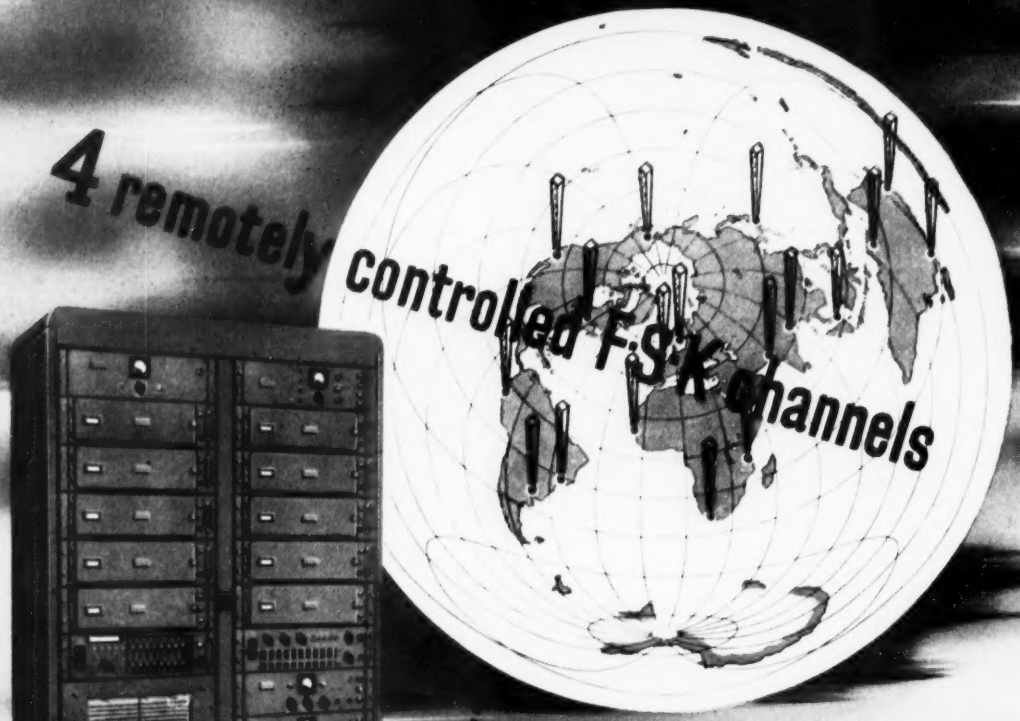

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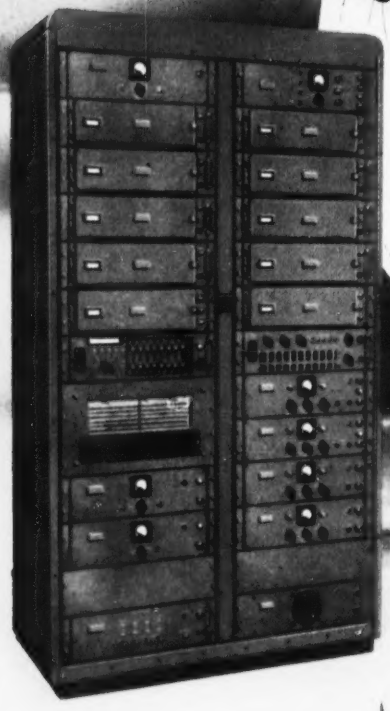

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LONG TREK TWO

Three Thousand Miles Round Africa by Vampire: A Coronation Odyssey

THIS graphic account of a Coronation "flag-showing" and aerobatic demonstration tour by 15 Vampires of No. 14 Sqn., R.N.Z.A.F., from Middle East Air Force was written by one of the pilots, F/O. M. F. McD. Palmer. It emphasizes, among other things, the reliability of these aircraft even when operating under unaccustomed conditions.

UP the mighty Nile to its source in Equatorial Africa, then east across the Dark Continent to the coral sands of the old Arab slave-coast of Zanzibar—that was the way No. 14 Squadron's pilots flew to Operation "Long Trek" into British East Africa.

The 3,000-odd-mile journey was accomplished so that the Vampire fighters could provide aerial displays to coincide with local Coronation celebrations in the main towns of Uganda, Kenya and Tanganyika. In addition, it gave the squadron valuable experience in long-range fighter navigation over varying terrain and proved to be a good test of unit mobility.

For the purpose of the trip and the displays the squadron was split into three flights—one for each province—each consisting of five Vampires, with their air and ground crews. These latter, with the spares and baggage, were carried by Valettas, two of which accompanied each flight.

The first party, bound for Nairobi, capital of Kenya Colony, was led by S/L. S. M. Hope, M.B.E., A.F.C., the squadron commander, and with him were F/O.s H. G. Moss, M. F. McD. Palmer and E. R. Short. These four form one of the two formation aerobatic teams which the squadron flies in M.E.A.F. displays. In the fifth aircraft was Sgt. Plt. Alan Dyer, a young pilot who recently joined the squadron. These five left Nicosia on May 24th, and on the next day the second five headed off for the capital of Tanganyika Dependency—Dar-es-Salaam— the coastal port opposite the island of Zanzibar, some 400 miles to the south east of Nairobi. Commanding this party was F/O. D. E. Hume, the other aircraft being flown by F/O.s J. L. N. Harris, J. N. Tanner and P. L. McFarland. These four do formation fly-pasts and individual aerobatics.

The second formation aerobatic team was led by one of the flight commanders, F/L. T. R. Rabone (who was awarded the A.F.C. in the Coronation Honours list). His team consists of Sgt. Plt. Thompson, F/O. L. M. Gillard and F/O. Soden. The fifth aircraft was flown by another young newcomer to the squadron, P/O. Smith. This team was to perform around Entebbe in the protectorate of Uganda, and left for there on May 26th.

In the R.A.F. Valettas accompanying each flight were the fitters and riggers of each Vampire in that party, together with a team of specialist tradesmen—wireless mechanics, electricians, instrument repairers, etc. Each ground party was in charge of a qualified senior N.C.O. responsible for servicing to the engineering warrant officer, W/O. C. R. Carter, who was in the Dar-es-Salaam party. Also in the party was S/L. M. F. Furlong, the R.N.Z.A.F. liaison officer in M.E.A.F.

The flights were staggered one day apart to allow for the limited refuelling facilities at some points. The journey to the furthest base had been broken into seven legs with a refuelling stop at the end of each and an overnight stay at three of them. The longest of these legs was 740 statute miles and the shortest 355, while the total distance to Dar-es-Salaam was 3,330. The longest day's flying was a total of 1,400 miles in three legs—each of which meant four hours in the air in the cramped cockpit of the Vampire. This particular flight was on the first day—from Nicosia to Khartoum, with refuelling at Abu Sueir in the Canal Zone and at Wadi Halfa. Wadi Halfa, incidentally, was originally laid down around 1930 as a staging-post for the old Imperial Airways flying-boats which used to put down on the Nile there on their way to Khartoum and the south. The Vampires in actual fact flew almost the same route pioneered over 25 years ago by the flying-boats.

The trip to Khartoum took the jets over the hot, rainless deserts of Egypt and Northern Sudan, the great area of monotonous yellow-brown sand, and granite mountains twisted into fantastic shapes by the action of sun, wind and sand. The sun here shines relentlessly in a cloudless sky, turning the dust and sand suspended in the air into a reddish mist reaching to over 30,000 ft, the height at which the Vampires flew. There are few landmarks except the narrow cultivated belt beside the Nile.

The flight arrived there about 11.00 hr. local time, and stepped out of the refrigerated cockpits of their Vampires into the dry, searing heat of an oven: 115 deg F in the shade! The heat smote them beneath the nose with an intensity that made their eyes water. Everyone there was in a continuous sweat—even the Sudanese. There was no relief from the heat: indoors the fans merely circulated hot air and even in the shade metal objects were almost untouchable. The sheets on the bed were hot, the cold water was hot (there was, in fact, only one tap anyway). Of course, as one local inhabitant put it, "it's quite nice in the evening you know, the temperature drops 20 degrees—right down to 95.

Yet here is the seat of government for Anglo-Egyptian Sudan, and the town of Khartoum is quite a fine affair with broad avenues

(Below) A pause during maintenance work on one of the Vampires at R.A.F. Eastleigh, Nairobi. (Lower right) Maoris in the squadron ground crew with a gazelle-horn trophy. The markings of the aircraft include the name "Moo Loo" (a mythical cow—mascot of a N.Z. rugger team); the squadron crest; and the "Twiga" emblem of Tanganyika province presented to each "B" Flight aircraft by the people of Dar-es-Salaam. (Right) Vampires getting airborne at Eastleigh churned up clouds of red dust causing difficulty during stacked take-offs and stream landings.

LONG TREK TWO . . .

bearing trams and buses and big American cars, and flanked by some fine modern buildings. But the Kiwis were glad to see it behind them as they took off next morning, heading south for Juba and Entebbe.

The hop to Juba was the biggest single leg on the whole trip—740 miles—and perhaps the most unpleasant. Across their track lay the intertropical front, where the different air masses of the two hemispheres meet with tremendous violence in a globe-encircling belt of cloud and storms. Huge thunderheads reach ten miles up into the sky; vast cloud layers stretch for hundreds of miles on either side; and, beneath, the earth is torn by lightning, whirling dust storms, or drenching rains. It is this front, moving with the seasons from the tropics of Cancer to that of Capricorn, that is responsible for the equatorial rain forests and lush vegetation of the tropics.

All the pilots got through safely to Juba, although some were forced to fly over 450 miles in formation in cloud, with their aircraft iced up (putting half their blind-flying instruments out of action) and relying for navigation on bearings passed to them by a friendly Comet on its way to Capetown. When they broke cloud, beneath them lay the green equatorial forests—a welcome change from the desert of the north—with their companion, the Nile, pointing the way to Juba airstrip, hacked out of the jungle on its banks. Juba, the administrative centre of southern Sudan, is at the southern extremity of the navigable Nile. Upstream from the town, rapids bar further progress to the paddle steamers and dhows that carry supplies and merchandise along the river from Cairo to Juba. The river is the only reliable, year-round link with Khartoum and the thousands of gallons of kerosine used by the jets refuelling there had to be brought up-river in four-gallon tins on board barges.

The single narrow strip, barely long enough for jet operations, lies amid big-game country. A few miles to the north feed the biggest herd of elephants in the world—8,000 strong—and from Juba comes most of the ivory used by the native carvers of Omdurman and Khartoum. Sometimes the big-game animals—lions, elephants, rhinos and hippos—stray on the strip itself and have to be " shooed " off before the aircraft can land.

From Juba to Entebbe, on the banks of the mighty Lake Victoria, is only 335 miles, and the Vampires made it over the lakes, marshes and rising ground in under one hour. This vast inland lake, almost 4,000ft up, is the second biggest in the world and from it stems the White Nile which, flowing past Juba, joins the Blue Nile from Abyssinia at Khartoum. Across its northern shores runs the equator, while the borders of Uganda, Tanganyika and Kenya meet in its waters near the eastern shore.

The airfield of Entebbe is a fine strip built on a peninsula jutting into the lake, and is the staging post for airliners branching east, west and south into British East Africa, Belgian Congo and South Africa. Through the airport buildings pass passengers from the Comets, which refuel on their way to Capetown. It was here that F/L. Rabone's party were stationed and where the natives got to know the Vampire as " totø Comet " (little Comet). The jet age is a commonplace reality in Uganda!

The weather favourably surprised the Kiwis. Pleasantly warm, it was hardly the climate they had expected to find in a place only three miles north of the equator. The two parties that pushed farther east to Kenya were even more surprised.

Nairobi, the capital of Kenya Colony, is 5,500ft up in the East African highlands, while only 60 miles to the north stands snow-clad Mt. Kenya, 17,000ft high. Here the party under S/L. Hope stayed, amid scenery that could have been New Zealand's Cambridge or Hawks Bay: green, rolling pastures and grasslands were dotted with poplars and African shade trees; cattle grazed peacefully like any New Zealand dairy herd, and only the coal-black herdsmen seemed out of place. The climate was a distinct shock to the New Zealanders, who found they were totally unprepared to face nights cold enough to call for a jersey or coat, and mornings of summer showers and rain.

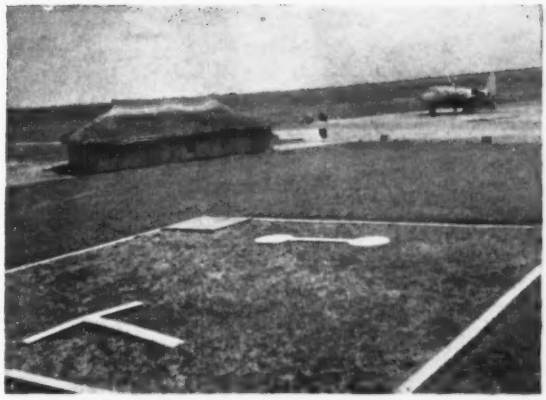
Only at Dar-es-Salaam, on the east coast of the continent, did the Kiwis strike the type of climate they had expected of equatorial Africa. Here the party under F/O. Hume found waving palms; white coral sand, with the long swell of the Indian Ocean breaking on the beaches; steaming mangrove swamps; and lush green jungle. The air was heavy with moisture and the winds warm, but the temperature was still nowhere near as high as at Khartoum or even at Juba.

Dar is in the protectorate of Tanganyika to the south of Kenya and the Vampires flew a route over some of the richest big-game country in the world. Their track brought them close to the famous Mt. Kilimaniaro, soaring over 19,000ft above the continent and where up until recent years the frozen carcase of a leopard could be seen high on the slopes, just as Ernest Hemingway has recorded.

Dar-es-Salaam is soon to become one of the big ports of the east coast of Africa, for, like Mombasa in Kenya, it is being developed to handle uranium mined inland in the Belgian Congo. At the moment, however, it is still a fairly small, happy little port, where ships lie offshore and cargo is conveyed to them by lighters, and the people are content to do next week what they could do today. The jet boys received a marvellous welcome when they arrived on May 31st, and found themselves something of "a seven days' wonder" until their departure on June 5th. The Vampires were the first jets ever to land at Dar-es-Salaam and practically the whole of the white and coloured population of the port were out at the airfield when they arrived; the natives were still there when they left. The latter would come down in their hordes in the morning and remain all day, cheering and clapping whenever the " steel birds of Europe ", as they called them, took the air. The jets flew every day, doing aerobatics and formation demonstrations over Dar itself, the island of Zanzibar, and various towns up and down the coast. The flying culmination of their five-day stay was on June 2nd, when they did a formation fly-past over the Coronation parade in the town and aerobatics over Dar-es-Salaam and Zanzibar. At the same time on the same day the other two flights were performing in Kenya and Uganda.

Over Nairobi the " formation four " aerobatic team of S/L. Hope, which had arrived on May 27th, were doing low runs over the parade in various display formations. Low cloud on this day had forced them to abandon the formation aerobatics for

(Below) The formation aerobatic team led by S/L. Hope prepares for take-off. (Below, right) At Dar-es-Salaam refuelling was from 44-gallon drums; the turn-round usually took about 30 minutes, the natives making hard work of the pumping. (Above) Vampires circle Kilimanjaro.



(Above) Vampires of "A" Flight at Mombasa with their attendant Valettas. (Right) The reception hut beside the control area at Juba.

which they had put in so many hours of practice back in Cyprus. Instead of their breath-taking display of loops, "spectacles," rolls and stall turns in tight box formations, and the spectacular loop in which they change from line-astern to box, the pilots had to be content with roof-top-altitude runs in figure four, box, line-astern, and echelon formations. But before they left on June 6th, the four had done formation aerobatics over Nairobi town, the airfield, and many up-country towns, as well as over the coastal port of Mombasa some 400 miles away, for which they had made a special trip down in the morning and returned the same afternoon. In addition, they had done long-range cross-countries up into the Aberdares and the Kikuyu reserves around Fort Hall, Nyeri and Thompson Falls, to show the people around the lonely isolated farms up there that they were not being forgotten during Coronation week.

The team at Entebbe were more fortunate with the weather for their Coronation display. They were able to turn on formation aerobatics over the parades in Entebbe and Kampala as well as other smaller towns around Uganda and over the big Coronation canoe regatta on Lake Victoria. During this last display they were filmed by the B.B.C. and N.B.C. for the television show of Coronation events throughout the Empire, and by now have probably been seen by millions in America and Great Britain.

As each team completed its schedule of displays in each of the provinces, they flew back on their tracks, arriving at Entebbe on June 6th. The Dar-es-Salaam party meanwhile had spent some three days in Nairobi, with S/L. Hope's team, and the air and ground teams of both groups had been over the wonderful National Game Park: an area of about 300 square miles where all the African big game can be seen from the visitor's car windows, living in their natural habitat and in their natural manner. Everyone had seen giraffe and zebra, antelope, warthogs, wildebeeste, jackals and hyenas, ostriches and many other African animals, and the party at Entebbe had been shown around the lake shores, where there are alligators and hippos.

The airfield at Entebbe, when the three flights assembled on June 6th, looked more like a fighter station than a big civil airport. In addition to the 14 Vampires of No. 14 Sqn. there were seven Venoms and a Meteor which were staging through on their way to take part in the Rhodes Centenary celebrations in Rhodesia. That same day the squadron put up an eight-aircraft formation which flew over Kampala and Jinga in a final gesture to East Africa. The next morning the five aircraft of F/L. Rabone's party took off and headed north on their way home to Cyprus. F/O. Hume's party left the next morning and the team of S/L. Hope on the 8th.

Each team stopped at the same refuelling points as they had on the way down and flew the two-and-a-half thousand miles in two days. On this return journey the flights struck some minor unserviceability, which delayed various aircraft; but all the Vampires were back at Nicosia by June 12th. Some of the ground-crew did not get back until the 15th, however, as some of the Valetta tenders went unserviceable at frequent intervals; S/L. Hope's flight was left without an attendant ground party, the pilots doing their own servicing.

Throughout the operation the squadron flew 332 hours, equivalent to 126,000 miles in a total of 305 flights. They flew all the assignments allotted to them and earned the praise and gratitude of the people of East Africa. In fact, at Dar-es-Salaam the "four" were honoured by having the crest of Tanganyika presented to them by the Governor, and a replica of it was painted on each of the aircraft, to be flown throughout the world as long as No. 14 Squadron continues to fly. And if the air- and ground-crew maintain the high standard they set on "Long Trek Two," they will continue to fly for a long time.

MORE RECORDS BY DUNKERLEY

THE Royal Aero Club announces that Mr. Fred Dunkerley, holder of six point-to-point speed records for light aeroplanes, class C.1.C. (1,000 to 1,750 kilograms (2,204.6 lb to 3,858.0 lb)), set up three more records on July 28th in his Miles Gemini (two Cirrus Minor 2) between London and Dublin. His previous records were flown on June 5th between London and the Hague, and London and Brussels.

The speeds and times achieved by Mr. Dunkerley in his most recent record flight, subject to confirmation, are as follows: London-Dublin, 149.1 m.p.h., time 1 hr 55 min 21.7 sec; Dublin-London, 182.6 m.p.h., time 1 hr 34 min 12 sec; London-Dublin-London, 164.0 m.p.h., time 3 hr 29 min 48.3 sec. Distance flown from Croydon Airport to Dublin Airport, 286.8 miles; total distance flown, 573.6 miles.

Mr. Dunkerley was a close friend of the late Tom Hayhow, who lost his life while attempting a record flight between London and Belgrade. Mr. Dunkerley hopes shortly to attempt the same flight himself, as he is anxious to capture this record for Britain.

VISITORS BY AIR

THE annual report of the British Travel and Holiday Association gives the number of overseas visitors to the U.K. in 1952 as 733,000, compared with 712,000 in 1951. There was no significant increase in the proportion (approximately one-third) of visitors to arrive by air. American, Commonwealth and Dutch visitors were the most air-minded; about two-thirds of the 95,000 Americans who came to Britain arrived by air, as did 63,000 of the 105,000 Commonwealth visitors and approximately one-half of the 35,000 people who came from the Netherlands.

RADAR STORM-WARNING

THE prototype of a new radar installation intended to detect storm clouds dangerous to aircraft has now been in service for several months at Entebbe, Uganda. It is the Decca Storm-Warning Radar Type 40, and has been developed on the same principles as the Decca Marine Radar, in consultation with the East African Meteorological Department.

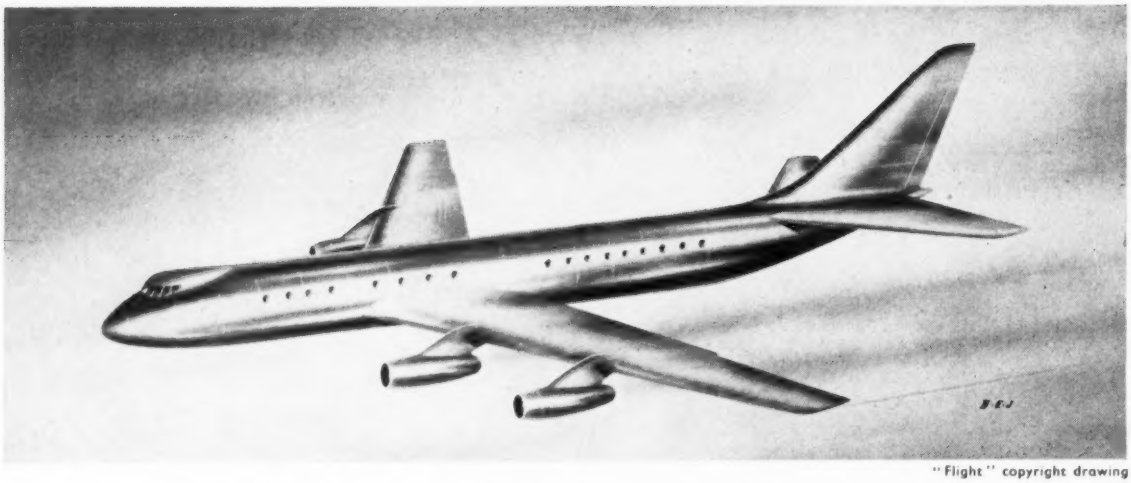
The set has been found to be capable of detecting storms at more than 100 nautical miles range, and the improved production models now being manufactured are expected to show an even better performance. The installation comprises four units: the scanner, receiver, display unit and power unit.

The scanner employs a rotating aerial and an R.F. unit. Its aerial incorporates two separate "cheese"-type reflectors for transmitting and receiving respectively, while the R.F. unit (containing modulator, magnetron, klystron, mixer and receiver pre-amplifier) is placed in a watertight housing directly under the aerial, with which it rotates.

The receiver is wall-mounted, and contains the I.F. and V.F. amplifiers, the pulse generator for the modulator, and power packs for the R.F. and display units. The display unit is fitted in a cast light-alloy case, and contains all controls for the set. It incorporates a long-afterglow tube, a cowl and rubber visor, and a strobe range-marker.

The power unit consists of a motor alternator fitted with an automatic voltage regulator and a speed governor, the output voltage being controlled by pre-set adjustment.

It is understood that the Entebbe set has been of great operational value to meteorological staff and aircrews, and is also proving a most useful aid to research. The first of the new production models is shortly to be delivered to South-East Asia.



"Flight" copyright drawing

BOEING'S NEW AIRLINER

Thoughts on the American Approach

NEVER, in our experience, has the world of aeronautics known such keen rivalry as now exists between this country and the United States in the sphere of modern transports.

It is an accepted fact that America has been left at the post by de Havilland's Comet and, naturally enough, she is busily engaged in turning out explanations. The most frequent "line"—and, it must be admitted, one with more than a degree of truth—is that American air-transport companies are owned by shareholders who have to be presented with a healthy annual balance-sheet and who, therefore, are not prepared to finance what might turn out to be costly experiments with uneconomic aircraft.

The whole position is rather delicate, and only the very strongest American constructors can dare to try to produce a modern transport at present. But, for any company willing to take the huge risk, there is a rich prize. Such a company is the Boeing Airplane Company, and it is common knowledge that they have now been at work on a jet transport design for at least two years. In this work, they are committing a lot of their own money, but they are covering themselves by having a joint civil/military application for their new transport.

Until recently, Boeing were keeping quiet about their design. But they have now reached the stage at which provisional specifications can profitably be supplied to prospective buyers and, as soon as this happens, American journals very soon have everything in print. *Aviation Week* has now published much of such a specification and, to the best of our knowledge, it is truthfully applicable to the prototype of the new Boeing. Accordingly, we have, from the basic specification, prepared this commentary and drawing of what is likely to be an aircraft of the greatest consequence.

The first, and lasting, impression that the Boeing B.707 gives is that it is a "natural." This is to be expected, for it is indeed the logical outcome of many years of large-jet design. The company has, since 1944, produced hundreds of highly unconventional bomber studies but, when it came to selecting the best for eventual production, the B-47/B-52 arrangement has won. The same thing has happened in the case of the B.707, or "Project X" as it is often referred to.

The governing factor is undoubtedly the wing. This standard Boeing wing is undeniably efficient; in fact, the company claim that it has shown up well in tunnel tests in comparison with crescents, deltas and other "fancy shapes." It has a low-drag section about 9 per cent thick, and the aspect ratio and sweepback are, respectively, seven and 35 deg. It is a fine piece of geometry and has much to commend it—more than can be properly discussed in the present article. But it demands a great deal in return.

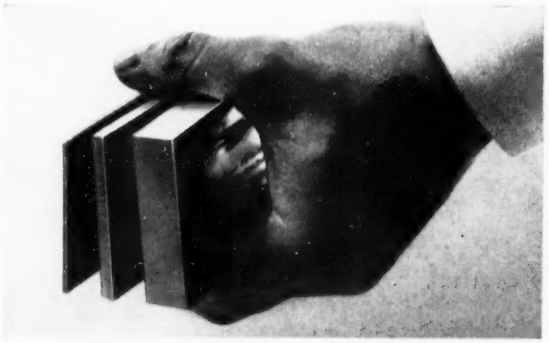
Skin thickness is the first consideration. This may not appear of great significance, but it is vividly illustrated by the accompanying photograph. On the B-47 the skin is machined from 75S hard aluminium alloy sheet and the root thickness is $\frac{3}{4}$in. On the B.707 it may be thicker. As a result the wing is likely to weigh over 20,000 lb, and it also poses severe problems in manufacture. Quoting J. W. Barton, Boeing's chief cost accountant, "Rivets are heavier on the jet; high-shear rivets and lock bolts must be used for structural efficiency. Tolerances are very much closer, requiring precision inspection of each and every bolt hole and countersink. The standard quarter-inch electric drill and half-inch air motor have been replaced by automatic air-feed drills which must be counterbalanced from overhead. A drill cage to position the drill and locate the hole must be built, and a handling sling must be provided." Assembly jigging is also likely to become inordinately expensive.

Having accepted all these very real drawbacks, one certainly does get a smooth, flexible wing with a critical Mach number of over 0.9; but we know what most British transport designers feel about such wings, and cannot but agree with them.

As a corollary to the Boeing wing, the pod-mounted turbojet in another "natural." So much can be said for, and against, the pod that no comments will be raised here. No doubt Mr. G. S. Schairer will explain his company's adherence to the formula when he addresses the Anglo-American conference in September.

Fuel tankage in the B.707 is seen from the ensuing description to be truly enormous. All the fuel is carried in the wing, between the two spars—some of the fuel admittedly lying within the fuselage as well. (In the B-47 all the tankage was in the fuselage.) There is, of course, all the difference in the world between a bomber and a transport when it comes to stowing things away. The former has an unpressurized hull with a small pressure compartment in the nose. The transport is pressurized throughout.

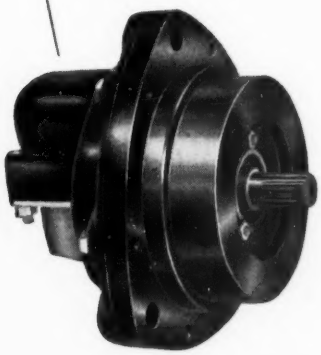
The most critical item of all is probably the undercarriage. In the B-47 and B-52 it was simple enough to tuck the main gear



The steady increase in wing skin gauge of Boeing aircraft is well brought out by these three exhibits. The thinnest has been prepared from B-17 skin; the intermediate represents B-29 practice; and the thickest is made from B-47 sheet, $\frac{3}{4}$in thick between the spars.

SM 2

Yesterday he was in London (Ontario)



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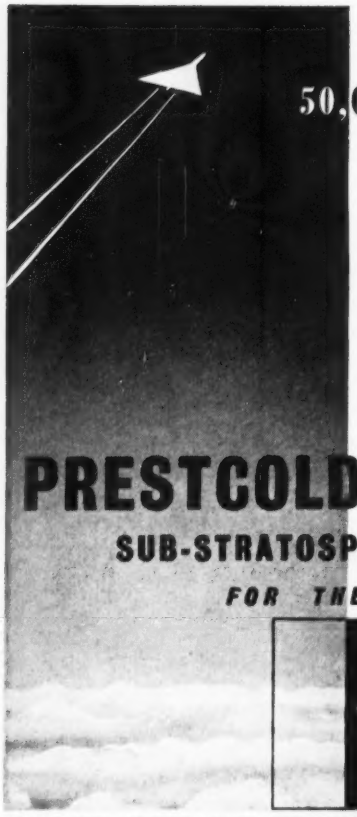

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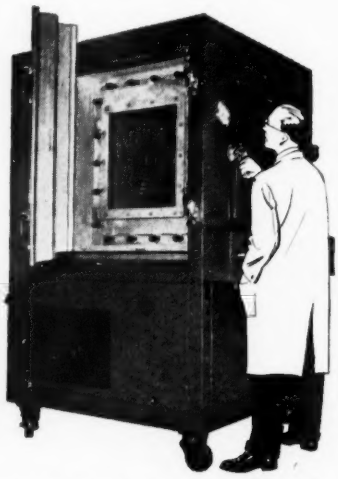

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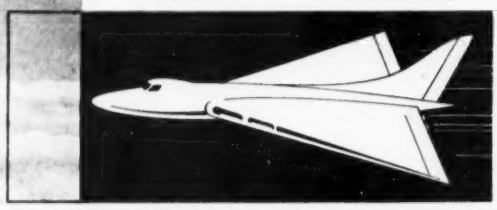

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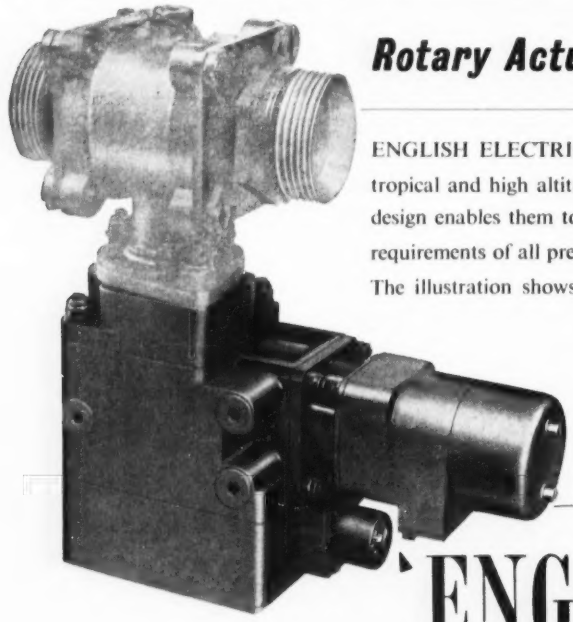

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AE.1

BOEING'S NEW AIRLINER . . .

away in the belly; but the B.707 makes this almost impossible. At the time of our commercial issue of March 6th last we wrote (p. 286) that the mainwheels would probably retract into twin jet pods, between the engines. This still appears the best solution, but the B.707 will, apparently, retain the B-47 landing gear. Two pairs of mainwheels are used, retracting into the fuselage—presumably into the pressurized lower deck. When lowered, the axles are but 21ft apart; this is a surprisingly short wheelbase, and one that could lead to pitching troubles, especially upon application of intermittent brake. The mainwheel tyre pressure is some 170 lb/sq in; anti-skid brakes are fitted, and the front undercarriage steers hydraulically over the wide range of ±55 deg. Stabilizing outrigger wheels are probably housed in the inner jet pods.

The massive fuselage is well shown in our drawing. The overall length of 127ft 10in quoted in the data includes the swept rudder overhang, the true hull length being 122ft 2in. The fuselage is pressurized to a differential of about 9 lb/sq in over almost the entire length and throughout both decks. The upper "bubble" has a diameter of 11ft and the usable passenger cabin length is 89ft; the lower deck is much shorter and of smaller diameter. As might be expected of a fast aircraft, the re-entrant groove along the outside at the join between the two bubbles has been faired over with a thin wall of unstressed skin. The fuselage thus appears rather slab-sided, with a rounded top and bottom.

The cockpit enclosure resembles that of the Viscount or Super Constellation, in that it breaks the top line and protrudes somewhat. The two pilots, seated side-by-side, should have an excellent view. Heavy, double windows are to be used throughout, but we will be very surprised if Boeing have followed the C.A.B. recommendation regarding outward-opening doors. It is probable that doors for both crew and passengers will be fairly small, elliptical structures admitting to the lower deck.

The wing, although having similar profiles and characteristics to those used on the bombers, falls midway between the B-47 and 52 with its span of 130ft; again, the static dihedral of 7 deg is a reversal of the former "anhedral" policy. The fuel, given as wide-cut gasoline with a specific gravity of 0.78, is housed between the spars.

Over Fifty Tons of Fuel

No information is available regarding the type of tank specified, but the capacities are immense (figures are converted to Imp. gals.): outboard of the outer engine attachment (in each wing) is a 392-gallon tank. Between the pods is a 1,808-gallon tank, and between the inner pod and the fuselage is one tank of 1,958 gallons and another, next to the fuselage, of 1,540 gallons. Finally, there is an overload long-range tank in the centre-section (within the fuselage) with a capacity of 3,500 gallons. This adds up to a total capacity of 14,896 gallons which, at 7.8 lb/gal, weigh some 116,000 lb. There is to be a single pressure-fuelling point beneath each wing.

The tail is, like the wing, of striking geometry; no doubt the production airliner will have a curved dorsal fin. The vertical surface will, like that of the Stratocruiser and B-52, fold flat against the tailplane, in which condition the overall height will be no more than 22ft 6in. The large-chord tailplane will almost certainly be of the "all-moving" variety.

The flying-control system is fully powered by irreversible jacks, and a manual standby and emergency system is incorporated. The long-span ailerons are each divided into inner and outer sections; all parts are in use up to some 300 knots, but above this speed the outer surfaces become locked to avoid the imposition of excessive distortion on the wing. The flaps closely resemble those of the B-52, the gated positions being 20 to 30 deg for take-off and 50 deg for landing. Again making use of B-52 work, there is a two-section spoiler on each wing upper surface ahead of the flaps, to improve lateral control.

No air brakes are fitted, but the landing gear is stressed for use at high indicated airspeeds, and can be dropped to increase rate of descent. Whether reverse-thrust will be available in time for the early B.707s is uncertain, but there is every indication that a large tail-braking parachute will be standard equipment.

Power will be provided by four Pratt and Whitney JT3L turbojets, mounted in single pods. These engines are civil developments of the J57 military engine, and are fully equipped with anti-icing and water injection, but do not have afterburners. The basic engine is a typical member of the big Pratt and Whitney two-spool, all-steel family and, fully equipped, it is expected to weigh about 4,800 lb. With water, the sea level static thrust will be rated at 11,000 lb. This level of performance has not yet been cleared and the J57s flying in the two B-52 prototypes are currently governed at some 8,800 lb thrust, at which power the specific fuel consumption is probably about 0.78.

BOEING 707 DATA (PROVISIONAL)

Four Pratt and Whitney JT3L turbojets

Dimensions: Span, 130ft; length overall, 127ft 10in; height, 38ft 3in; height (fin folded), 22ft 6in; distance from inner pods to centreline, 26ft 7in; distance from outer pods to centreline, 45ft 7in; wing area, 2,400 sq ft.

Weights: Empty, 88,890 lb; service and buffet, 520 lb; water and food, 670 lb; crew and baggage (3 cockpit, 3 cabin), 1,080 lb; fuel and oil in systems, 920 lb; pyrotechnics, 40 lb; equipped weight, 92,120 lb; passengers (100), 16,000 lb; passenger baggage, 4,000 lb; cargo, 5,000 lb; total payload, 25,000 lb; fuel (9,350 gal), 72,880 lb; all-up weight, 190,000 lb. Wing loading, 79.2 lb/sq ft.

Performance: Cruising speed (estimated), about 580 m.p.h. at 35,000ft; range with 25,000 lb payload (estimated), 4,000 miles; take-off field length, 4,600ft at 120,000 lb, 5,100ft at 160,000 lb, 6,700ft at 180,000 lb, and 7,700ft at 190,000 lb; landing field length, 4,400ft at 90,000 lb, 5,700ft at 120,000 lb, and 6,600ft at 140,000 lb.

The single pods will have one-piece, detachable front cowlings, in which will be hot-air de-icing trunks. The large side panels will be hinged along their top edges; servicing is being made as easy as possible, and the basic layout helps in this regard, for the inner engines at least are but 37in from the ground. (It does appear, however, that so powerful an engine at this height constitutes a serious danger, and may wreck itself by picking up foreign bodies.)

Engine starting is achieved with the aid of a built-in compressed-air system: this may either be driven by an AiResearch gas turbine, or from a Boeing turbine as will that of the production B-52. Although not yet finalized, it is probable that most of the 707s auxiliary power will be furnished by low-pressure compressed air. These systems are becoming very popular in America and certainly can save weight on a large aircraft.

Performance of the J57 in the B-52s has received high praise from Boeing, and there is no doubt that, if the JT3L fails as a civil engine, it will be an enormous blow to several companies. But this is unlikely, for many thousands of hours have been put in on the type, and control response, specific fuel consumption, and reliability are good.

Accommodation in the 707 is entirely on the upper deck. The standard seating layout is likely to be for 100 passengers, with seats arranged three-by-two. These passengers should enjoy a good view, by virtue of the small wing chord; but the window size is likely to be less than generous. Cabin air requirements will be large, but it may have been found possible to tap the supply from the main engines. The lower bubble will be filled by cargo holds, the retracted landing gear, and a great variety of cabin-air, electronic and other equipment. In view of the considerable pressure differential it is hardly likely that bulky freight will be carried. On the other hand, if cargo can be got through a loading door, there should be plenty of room inside.

The first prototype will be completed as a basic airframe for demonstration to civil and military customers. In the Air Force its primary rôle will be that of high-speed tanker, for which work a refuelling unit will be mounted under the tail. Transfer tanks, with some 5,000 gallons capacity will be in the lower deck. As a tanker it will fill a vital need, in that it will be able to top-up B-47s and their successors at their cruising speed and, more important, at their operating height.

At the moment this first prototype is being built at the main Boeing works at Seattle. Many major assemblies have already been made and a great deal of rig testing has been completed. The design is, therefore, virtually frozen, and is likely to emerge very much as we have described it. It must not be forgotten that the company's work in the development of bombers, which has cost the American taxpayer a lot of money, has provided Boeing with a mass of information which would otherwise have cost millions of dollars and precious months.

Much still remains to be done. Nevertheless, Boeing claim that, next June or July, the first B.707 will "roll out" in an airworthy condition. According to Oswald Ryan, chairman of the C.A.B., this prototype has cost Boeing about £5,360,000; more interesting was his opinion that Boeing were strong enough to "go it alone" without help from Congress.

Production aircraft, if all goes well, are expected about the middle of 1956. The selling price is currently quoted at some £1,430,000, but we will be surprised if it remains pegged at this level—which is, in any case, very much more than will be asked for our second generation of jet transports.

RESERVES CLUB NEWS

THE R.A.F. Reserves Club luncheon was held at the Criterion Restaurant, London, on July 23rd, under the chairmanship of the Club's president, Air Chief Marshal Sir Guy Garrod, G.B.E., K.C.B., M.C., D.F.C. The guest speaker, Sir Miles Thomas, D.F.C., chairman of B.O.A.C., gave an informative talk on past and future operations of that organization.

The secretary of the Club is Mr. H. C. Room, M.B.E., who has recently taken over his duties in the new premises at 14 South Street, Park Lane, W.1.

AIRCRAFT INTELLIGENCE

AIRBORNE with eight aboard is the prototype Doman YH-31. This aircraft has 7ft-wide folding freight doors and is in production for the U.S. Army Transportation Corps. The Lycoming engine is mounted under the nose. The YH-31 is referred to in an item on this page.

Great Britain

D.H. 2-seat Venom. The Chester factory of de Havilland is now engaged in the mass-production of a number of types of two-seat Venom fighter. At present, the only squadrons of Venoms are those equipped with the single-seat FB.1. Principal production types are the NF.2 and 3, both of which have the new clear-vision frameless canopy and the extended dorsal tail fins. Also being delivered are Sea Venom NF.20s for the Fleet Air Arm; these have a rather ungraceful shape of rudder (illustrated, on a French-built Sea Venom, on p. 17 of our issue of July 3rd last).

U.S.A.

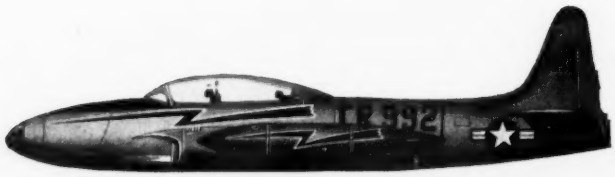
Convair XF2Y-1 Sea Dart. This delta-wing, hydroski fighter prototype was recently demonstrated in public at San Diego Bay. It appears that the little midnight-blue craft is fitted with wheels at the rear ends of its skis and under the aft hull, upon which it can move down a ramp into the water. Once launched, the water line rises to the level of the wing leading edge, with the skis well submerged. But when the two J34s are opened up and the craft begins to move, it very quickly rides up on the skis, which send a wide bow-wave just under the wing on each side. The run is estimated at about 4,000ft. Landing is made at some 100 m.p.h., lightly loaded, and takes half this distance. It is reported that taxying stability is enhanced by the fact that the Sea Dart banks when turning on the water.

Convair XP5Y. It is now known that the cause of the loss of this prototype (*Flight*, July 31st last) was an in-flight failure of the tailplane trimming system. At about 3 p.m. on July 15th, the big flying boat was off the Californian coast when it began to develop very severe pitching oscillations. After nearly half an hour of steep dives and climbs—during which time the structure remained sound and the four Allison T40 double turboprops continued to run—the aircraft was abandoned. Shortly after the crew of nine had bailed out, the XP5Y went steeply into the sea. Most of its uncontrolled gyrations were filmed by a chase-plane which had originally taken off to accompany a test flight of the XF2Y Sea Dart. It is understood that production of the R3Y Tradewind transport (of which the XP5Y was a prototype) will continue.

Doman YH-31. Doman Helicopters, Inc., are the patentees of a very neat hingeless rotor, which was originally tested five years ago in a Sikorsky R-6. They have been developing their own helicopters for several years, and received a contract for a small series of YH-31 cas.evac. aircraft, the first of which is shown on this page. Powered by a 400 h.p. Lycoming flat-six engine mounted in an inclined position, the YH-31 has accommodation for four stretchers and a medical attendant. As a civil, multi-purpose, aircraft, it is styled LZ-5. At present there are signs that production of the H-31 may be undertaken on a large scale, for a contract has been awarded to Hillers (who have a larger factory) to build the Doman helicopter under licence. Doman are now developing an enlarged variant powered by two 200 h.p. Boeing Model 502 turboprops.

LOCKHEED T-33A
(Allison J33-A-35)

Span	...	...	38ft 10½in
Length	...	...	37ft 9in
Height	...	...	11ft 4in



FACTS ABOUT THE GLOSTER JAVELIN / *Super Priority for the R.A.F.*

Landing

LANDING an aeroplane in limited visibility can be an arduous and difficult task. The Javelin pilot, however, is assured of a good forward view, low landing speed and positive control right to the touch down, where the wide-track undercarriage and powerful brakes ensure a steady landing run of minimum length.

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✔ A quarter million miles between overhauls

✔ Highest annual jet-engine utilisation in the world

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DE HAVILLAND ENGINES

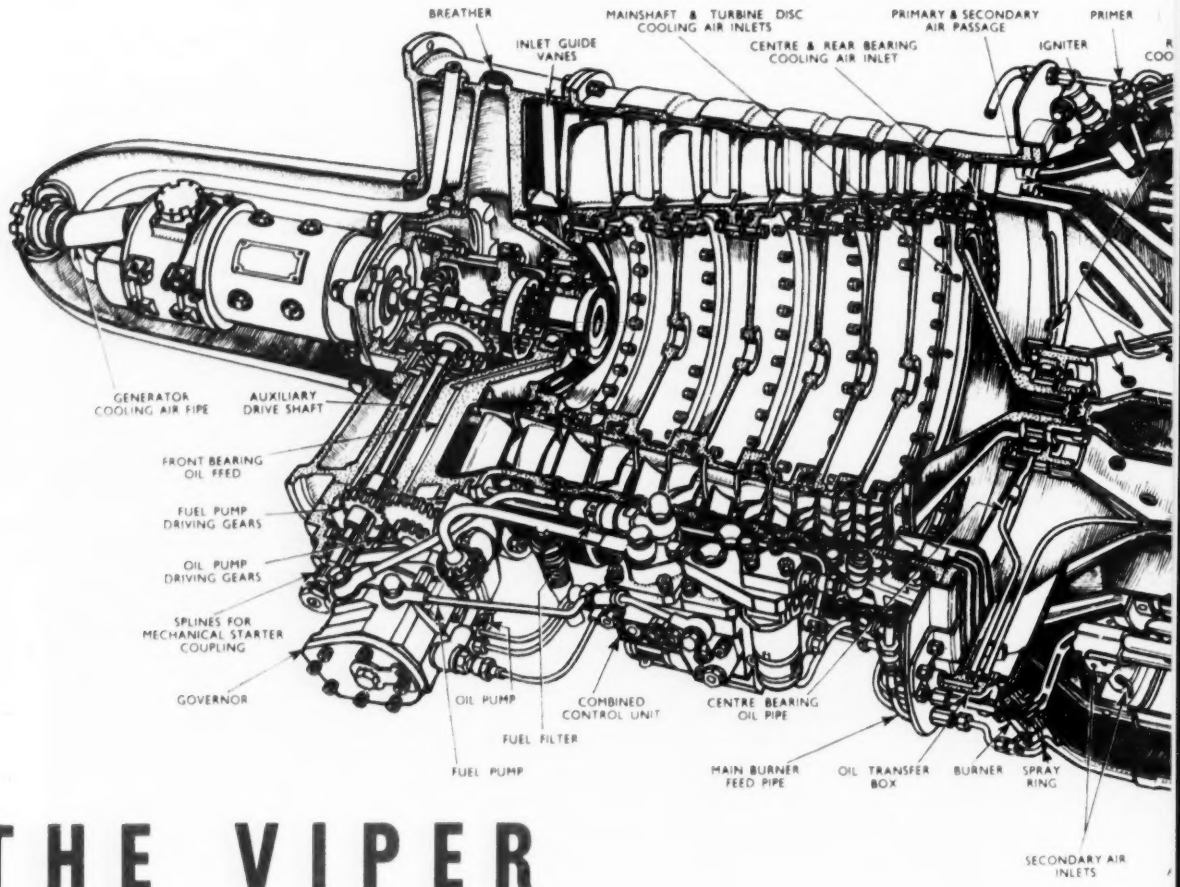
DH
ENGINES

Wings of the World at C.F.S.

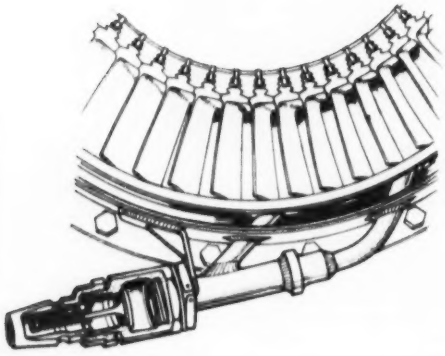
AT the 41st anniversary dinner of the Central Flying School at Little Rissington—to which reference was made in our previous issue—this fine collection of wings was presented to the School by the Commandant, A. Cdre. A. D. Selway, C.B., D.F.C. Gathered by him personally, they represent the 43 nations and Services pilots from which have received training at C.F.S. since it was formed in 1912. At this same dinner a portrait was unveiled of the guest of honour, Marshal of the R.A.F. Sir John Salmond. As Captain J. M. Salmond he was one of the first members of the instructional staff at Upavon in 1912, having been "encouraged by mere ground instruction to go solo at Hendon" earlier in that year.

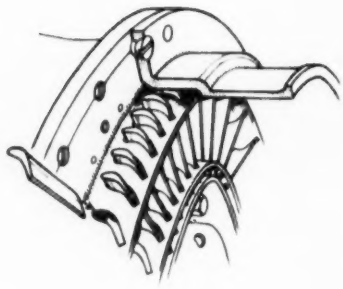
Armstrong Siddeley Viper ASV.3

Seven-stage compressor, annular combustion chamber and single-stage turbine. Direction of rotation: anti-clockwise looking forward. Maximum diameter over combustion chamber, 23½in; overall length, excluding generator, 65½in; jet-pipe external diameter over lagging, 15in; propelling nozzle diameter, 11in (84 sq in); dry weight, 365 lb; air mass flow (sea level static at full power), 30 lb/min.



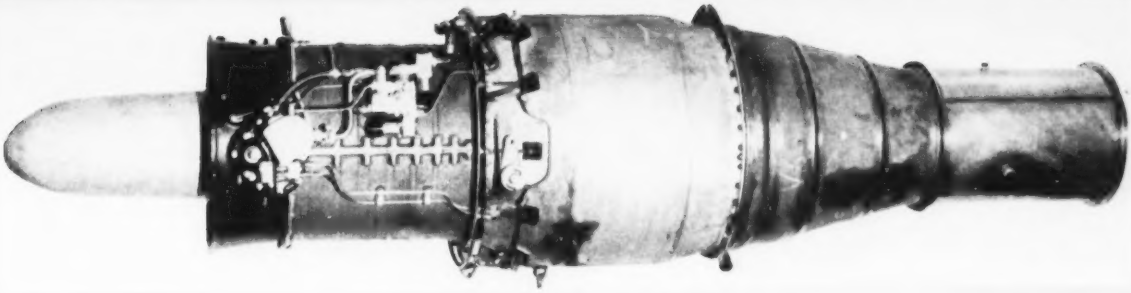
THE VIPER

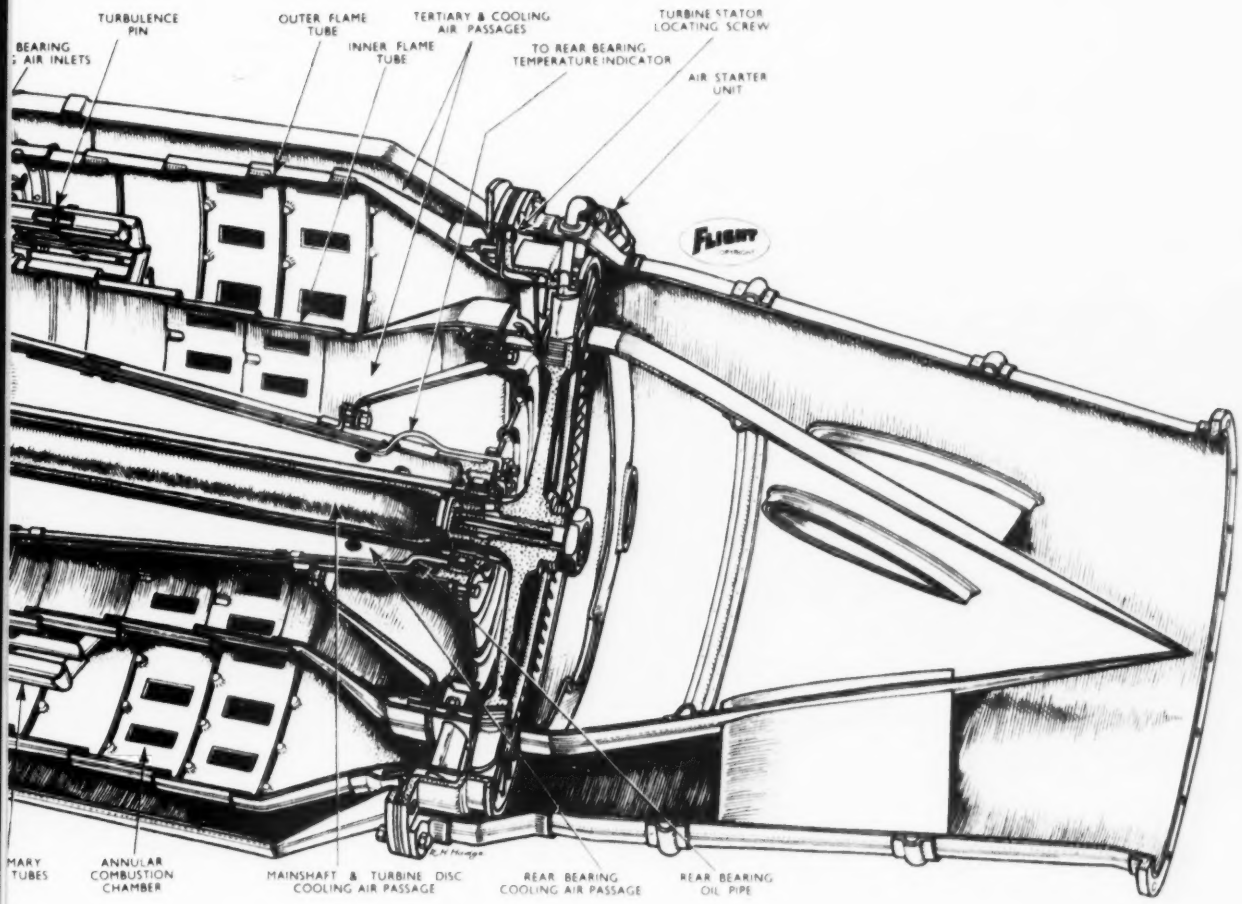




The Viper is started by a simple air-jet (left), the two nozzles of which direct air at 120 lb/sq in against the main turbine. The non-return valve is evident.

The fully-floating stator blades are retained in two rings, the massive stator shroud preventing longitudinal movement.

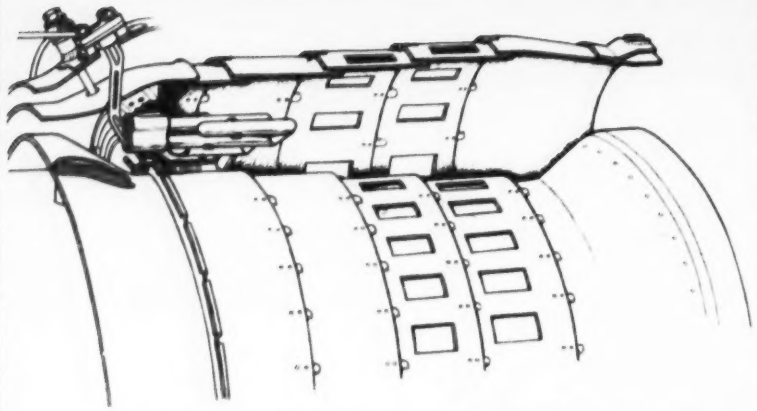




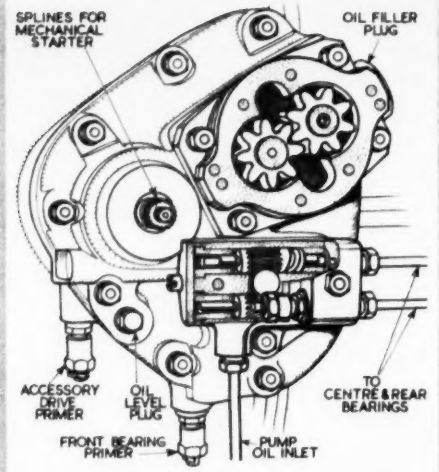
LITTLE engines can never attract quite the same interest as can big engines; particularly in the case of the Viper is this to be regretted, for this small turbojet has as much ingenuity per pound of weight as is to be found in any aircraft power unit. A full description of the Viper is now permissible, and the succeeding pages will show the manner in which this most compact turbojet reflects our ability to develop cheap and efficient aero engines better, perhaps, than any other country.

The Viper really inherits the work of two companies, Armstrong Siddeley Motors, Ltd., and Metropolitan Vickers. Armstrong Siddeley's first small turbojet was the Adder, which was virtually a Mamba with the reduction gear and airscrew drive removed. It was produced principally for the Pika and Jindivik I prototypes built by the Directorate of Aircraft Production in Melbourne. This engine and airframe combination dates from about 1950, and the Adder, although by no means as efficient for this work as the Viper, was developed because the Australians wanted an engine quickly in order to get the first Pika flying; the Viper was at that time two to three years distant.

The Viper should by no means be looked upon as a development of the Adder. Rather is it an engine entirely in its own right, bearing close family resemblance to the Sapphire. Particularly noteworthy features of the Viper are its annular combustion chamber (which, like that of the Sapphire, is based upon original Metrovick work) and the vaporizing burner system developed by the Armstrong



The annular combustion chamber is unusually straightforward. The "walking stick" vaporizing burners spread the flame evenly throughout the space. The smaller sketch (right) shows the accessory-drive, fuel pump and oil pump.



THE VIPER . . .

Siddeley combustion department and first applied to the Mamba turboprop.

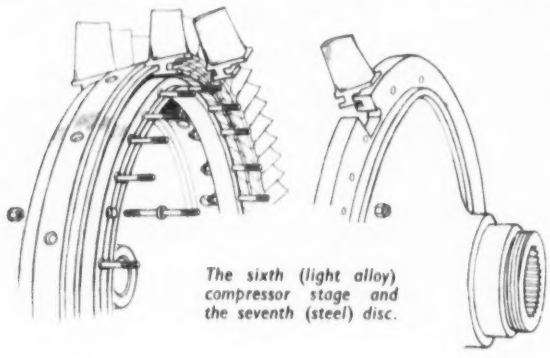
Design work on the Viper started early in 1950, at which time its sole immediate application was as the power plant of the Jindivik pilotless target aircraft. It was, therefore, originally conceived as a "short-life" engine, the designed life being ten hours. As a consequence, not only was it planned as an engine of extreme simplicity, but a number of components were considered capable of manufacture in materials less expensive than those normally used.

It is of interest to note that, although fuel consumption was not considered of prime importance, and the compression ratio of the Viper is not greater than 3.5:1, at no time was a centrifugal compressor considered. Armstrong Siddeleys are, of course, an entirely axial firm, and we agree with them that any deviation from this policy would have been retrograde. In any case, the axial arrangement permits the Viper to be housed in the extremely small-diameter fuselage of the Jindivik.

During 1950, detail design proceeded steadily, and even at this time the Viper was looked upon as a very important engine, although it has never enjoyed top priority, as have the Sapphire and Double Mamba. At this time, the new engine was termed ASV.2, and the design thrust was 1,575 lb. This brochure performance was exceeded on the very first run, which took place in April 1951, and a ten-hour type test was successfully completed one week later. Accordingly, a higher rating of 1,640 lb was aimed at, and the engine re-styled ASV.3.

Before describing the present ASV.3 in detail, it is as well if the history of the engine is briefly considered. As previously mentioned, the short-life nature of the original Viper made it possible to dispense with certain of the more expensive temperature-resistant alloys commonly used in gas turbines. Particularly is this true of the turbine itself. The first two Vipers used turbine blades machined from Nimonic 90, and a disc of Rex 448, partly to ensure success with the early running and partly because plenty of this material was available from existing stocks.

Then a cheap disc of E.N. 19T austenitic steel was adopted, with blades of Rex 467; this turbine was first tested in September, 1951. Another change in the hot part of the engine was a change of flame-tube material from Nimonic 75 to D.T.D. 571 stainless steel sheet. These also were tested in September 1951, and were found perfectly satisfactory for the ten-hour life of the original engine, but a reversion was then made back to Nimonic 75. This is probably explained by the negligible difference in price between the two materials coupled with the fact that the Nimonic sheet was readily available and its fabrication—welding in particular—was familiar to the Armstrong Siddeley works.



The sixth (light alloy) compressor stage and the seventh (steel) disc.

In November of 1951, the ASV.3 expendable engine underwent an actual type test at 1,640 lb thrust. The following April a special 25-hour endurance test was successfully completed, originally in order to get clearance for flight in Armstrong Siddeley's Lancaster test-bed. The ASV.3 was first airborne last November in the tail of the well-known Lancaster which at various times has had a Mamba in the nose and an Adder in the tail, the latter engine being replaced by the Viper. Vipers have continued to fly in this aircraft ever since, and a considerable amount of general performance testing has been completed, as well as some modification to a number of fuel-system components.

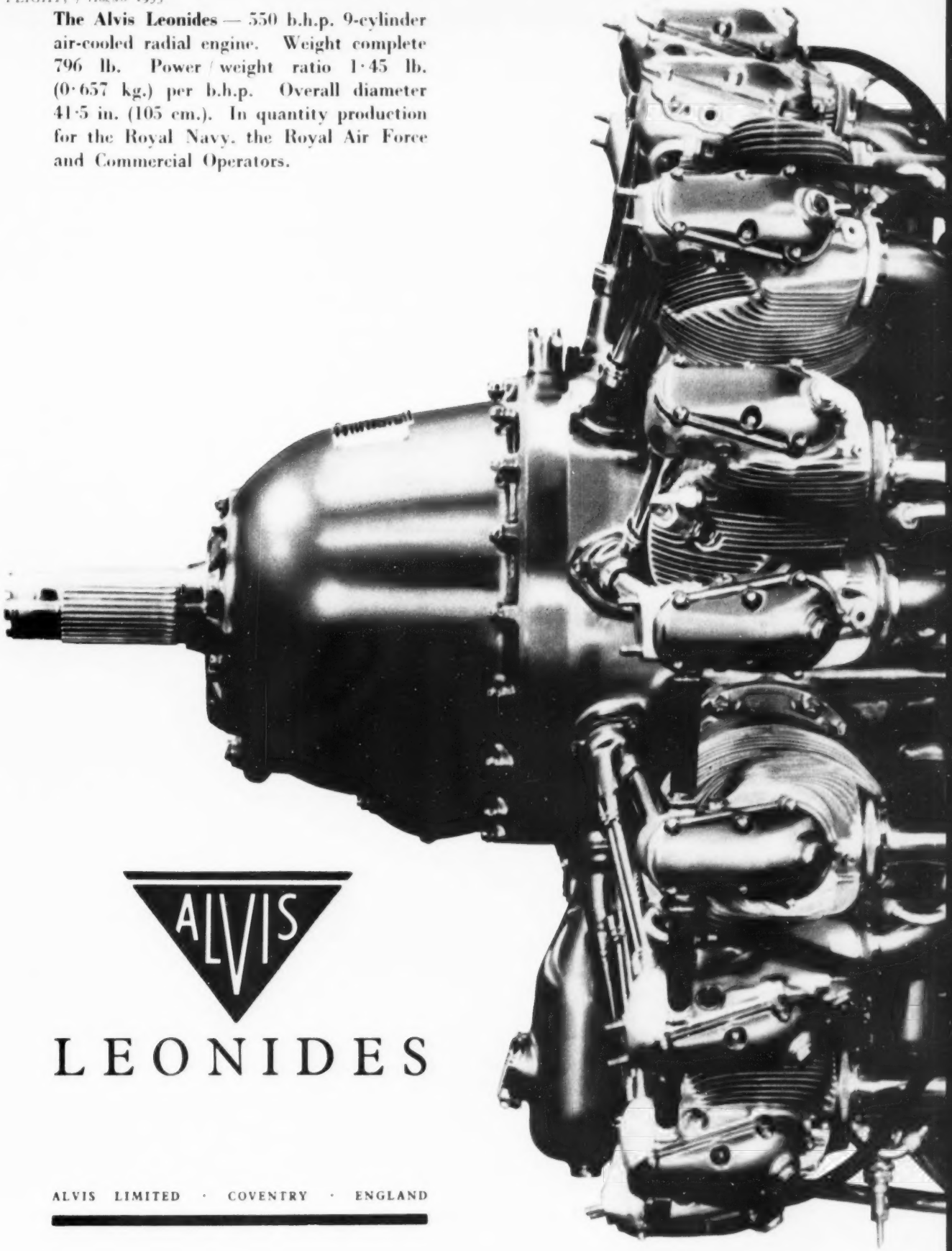
The 25-hour endurance test opened up possibilities for the Viper which had not previously been considered: it soon became evident that there would be a need for a turbojet of this type to power a number of piloted aircraft designs, and the Viper's ready availability and remarkable durability indicated that the engine could fairly easily be modified to fill this need. One engine was therefore modified with a slave fuel system and a larger thrust bearing and put to a 50-hour test at maximum r.p.m. in January of this year. Finally, in June, the same engine successfully completed a 150-hour type test to the standard M.o.S. schedule. The long-life Viper is known as the ASV.5, and will be described at the end of this account.

At the time of writing, the Viper's total bench time is of the order of 750 hours, to which should be added some 45 hours mounted in the Lancaster, of which about 30 have been logged in the air. The engine has for long been cleared to run for 25 hours, and the figure is now 50 hours, and rising steadily. The present Viper will now be described.

Compressor.—The axial compressor has seven stages, and a pressure ratio of 3.5:1. The front disc is manufactured from hardened nickel-chrome steel known as E.N. 34. The next six discs are machined from aluminium alloy, and are held together in a most unusual manner. To assemble the compressor, the front steel disc is placed on the bench facing downwards, and the first row of 29 compressor blades of R.R. 57 alloy placed around its periphery in a circumferential slot. The second disc, of light alloy, has a mating peripheral slot which is filled with Marco resin—an anti-fretting compound—and this second disc is then placed on top of the first and bolted down with 20 2B.A. bolts; self-locking Simmonds metal-diaphragm nuts are used, tightened with a torque spanner.

The same procedure is followed for the attachment of the remaining five light alloy discs, and the final end-disc, which is another unit of E.N. 34 steel. Each section is attached with two more bolts than the preceding one, and when the compressor assembly is completed, the end bolts are correctly tightened and the unit is balanced. As far as possible, discs are so arranged that their out-of-balance forces approximately cancel out when

The Alvis Leonides — 550 b.h.p. 9-cylinder air-cooled radial engine. Weight complete 796 lb. Power / weight ratio 1·45 lb. (0·657 kg.) per b.h.p. Overall diameter 41·5 in. (105 cm.). In quantity production for the Royal Navy, the Royal Air Force and Commercial Operators.



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THE VIPER . . .

the compressor assembly is completed. At the end of the last compressor stage a gap of 0.150in exists, through which cooling air can pass to the centre and rear bearings and to the front of the turbine disc. In line with the sixth row of stator blades a series of radial holes is drilled in the compressor drum to admit air to the inside of the compressor and thence by way of the hollow drive shaft to the rear of the turbine disc.

Hoffmann provide all the bearings. The front bearing is a thrust bearing using large-diameter balls; it is not provided with any cooling air supply. The centre and rear units are roller bearings, and each of the three bearings is supplied with oil at the rate of ½ pint/hour. The main air intake at the front of the engine is a sand casting in L.124 magnesium alloy. The casting is machined over its flanges and drive faces, and finally polished and lacquered. It has three intake webs which, seen from the front, contain a drive shaft at three o'clock, a drain at seven o'clock, and a breather at 11 o'clock. At the rear of this casting is bolted the front bearing. The compressor casing is formed in two halves of light alloy, bolted together along the horizontal centre line.

Burners.—The fuel system itself is described overleaf and the story is here taken up at the two fuel rings which encompass the engine at its mid-point. Forward of the engine bulkhead lies the main fuel ring, with a primer or starting ring behind. Welded around the front of the combustion chamber casing are 12 pads, to each of which runs a fuel feed from the main ring. At each pad, the supply is led into a small chamber and thence through a gauze filter and two metering orifices to a pair of burners. The primer fuel ring communicates with eight primers, two of which are adjacent to igniters; there are, thus, six primer sprays and two torches. K.L.G. plugs are used, screened around the outside.

The main burners are of the Armstrong Siddeley vaporizing types, the appearance of which has earned them the name of "walking sticks." They consist of a hollow steel pipe, turned back on itself through a pair of 90-deg welded joints. Fuel and hot compressor air are fed in at one end, and almost full evaporation takes place within the stick. The mixture burns at the other end of the stick, facing upstream, and the primary flame warms the stick to maintain evaporation. This arrangement permits the use of a low-pressure fuel feed at some 100 to 150 lb/sq in, so reducing the dangers of pipe fracture. It is also possible that less carbon deposition takes place.

In case it is not immediately apparent why the flow through the walking stick is always maintained in the one direction, it should be pointed out that the upstream-facing burner is screened from ram air by the annulus backplate. The other end of the tube, however, is open to full compressor delivery, and this is sufficient to blast the vaporized mixture upstream, where it ignites against the secondary air from the holes in the annulus. The sticks themselves are welded Nimonic 75 assemblies, and it is interesting to note that the original pattern featured a smooth curve. Sticks of this type fitted in another engine burned out owing to centrifugal force throwing the mixture against the outside of the bend and so preventing the vaporizing fuel from cooling the other side of the tube; the sharp corners induce turbulence which counteracts this, and the Viper sticks also have turbulence pins across their diameters.

Combustion Chamber.—The Viper's sheet-steel annular combustion chamber is exceptionally interesting, and typifies the simple but efficient character of the engine.

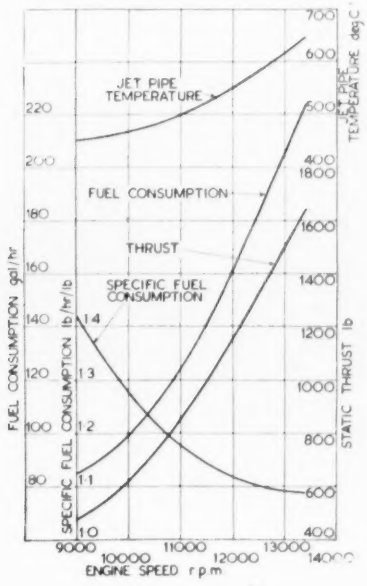
The entire assembly is prepared by Sankey and is welded from Nimonic 75 sheet. The configuration is clearly shown in the drawing at the top of p. 172. The flame tubes are spot-welded sections with tertiary air spaces between the welds. On assembly of the engine, they are slipped in and remain fully floating longitudinally to allow for expansion and contraction. In the centre of the drum formed by the annular combustion chamber is the main centre-section assembly which is virtually the backbone of the engine. Also a Sankey product, this is welded from mild-steel sheet and incorporates a long integral cone in 18-gauge sheet which supports the rear bearing. An extension to this cone locates the rear end of the combustion chamber and carries the stato-blade locating rings.

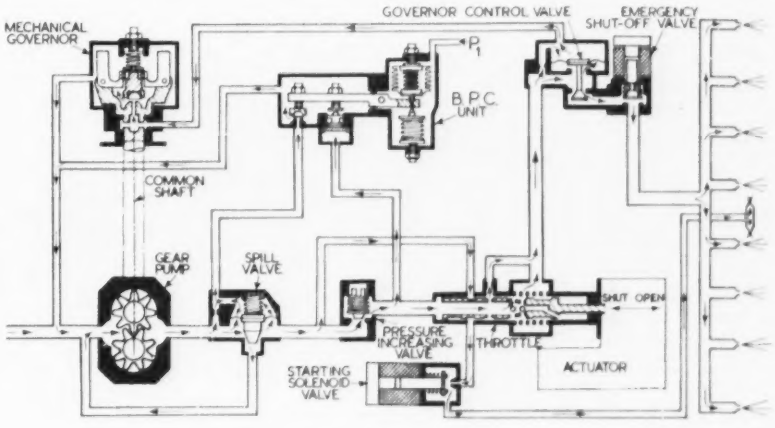
These rings, an outer and an inner, are pressings from Nimonic 75 sheet. During manufacture, they are punched with aerofoil section holes in which the constant-section stator blades are located accurately. These blades are cut from rolled strip of H.R. Crown Max, without twist, and are fully floating longitudinally. In fact, so free from restraint are they that, when the engine is being dismantled, one has to take special care when removing the outer shroud ring if the stators—93 of them—are not to shower over the floor. In use, the arrangement has proved completely free from trouble, and Armstrong Siddeleys attribute this to the fact that each blade can "come and go as it pleases." This is a good feature, for stator blading takes the fiercest heat of any part of the engine. Outside the outer blade-locating ring lies the main turbine stator shroud ring. This is almost the only expensive part of the whole engine, for it is machined from Rex 448 creep-resistant steel. At the bottom of this ring is situated the rear engine mounting, which locates the engine against pitching movements. Like the two main trunnion mountings, it has a spherical metal bush insert.

Turbine.—The turbine disc is machined from E.N. 19T heat-resistant steel, in the periphery of which are broached fir-tree slots to receive the roots of the 113 blades. The latter are machined by Metrovick under sub-contract, the material being Rex 467. They are unshrouded and are located by locking tabs, which consist of two small strips of steel spot-welded together at their mid-points, and used in the manner of a split pin.

The main shaft is a tubular forging of E.N. 8 high-carbon steel, carefully machined all over. A large bolt—hollow, to allow cooling air to flow to the rear face of the turbine disc—is passed through the centre of the turbine from the rear, and screwed firmly into the main shaft, so tightening up a Hirth-type coupling at the front of the turbine. This coupling permits the turbine/compressor assembly to be accurately located in the angular sense, and so eases balancing. At the forward end, the mainshaft is splined to fit into a hole in the rear compressor disc, where it is held by a split collet and ring nut. There is no spherical coupling, for sufficient play is allowed in the assembly to obviate difficulty due to mis-alignment.

Performance of the present ASV.3 (left) is now being surpassed by later Vipers, such as the ASV.6, with a quoted thrust of 1,900 lb. The fuel system (below) is shown in diagrammatic form.





THE VIPER . . .

Balancing.—The compressor rotor is first balanced on its own, plasticine being added to suitable portions of the drum until correct balance has been achieved. Metal is then removed from ribbing strips on the front and rear steel discs according to the weight of plasticine added. The rotating assembly is then completed right back to the turbine and balanced, as many as four turbine blades being cropped up to ¼in. if necessary.

Tailpipe.—The jet cone is yet another Sankey product in Nimonic 75 sheet. It is a precision spot-welded assembly with a smooth central cone located by three streamlined struts. In the Jindivik, the tailpipe is cooled by an induced airflow.

Fuel System.—The accompanying drawing of the fuel pump, and the diagram of the system itself, do not require any great explanation. The choice of a gear-type fuel pump is almost unique, and has only been made possible because of the small fuel flow and unusually low pressure differential. It has worked excellently with all types of fuel, and is also exceptionally cheap to produce. Delivery from the pump is made at about 450 lb/sq in. From the spill valve, the fuel passes to a pressure-increasing valve which is solely to provide a useful positive pressure when the engine is being started. The fuel then passes through the linear throttle valve, which is positioned by an irreversible electric actuator. This actuator, incidentally, was originally designed for the Jindivik pilotless target, and its function is to translate a radio signal from a ground, or airborne, control unit into mechanical movement of the throttle. No doubt it would not be necessary in a piloted aircraft. From the throttle, the fuel flows through the governor control valve which moves in sympathy with the servo pressure, which in turn is a function of the position of the mechanical governor. Next in line comes the emergency shut-off valve, which provides virtually instantaneous interruption to the flow of fuel. It is simply a spring-loaded valve held back by a solenoid. The fuel then passes to the burner rings.

Other items in the system are the governor and the B.P.C. unit. The governor is, unusually, of a purely mechanical type, and this not only offers some advantages in reliability and cheapness of manufacture, but it also operates accurately irrespective of the density of the fuel. It is mounted on a common shaft with the fuel pump. The barometric pressure control unit by-passes a proportion of the pump delivery according to the throttle position and compressor intake pressure. It contains a sylphon tube housed in a chamber which communicates with the compressor intake, and is therefore maintained at P_1, or compressor ram pressure.

At present, the entire fuel system is composed of rigid pipe, with the exception of a Powerflex final hose to the main burner rings, and later Vipers may dispense with the rigid pipe completely. Lucas is the company principally concerned with the fuel system, and the throttle actuator is a product of Rotax Australia. Surprisingly, there is a tendency to switch over to kerosine; most of the Viper time has been logged on wide-cut gasoline.

Oil System.—The oil pump is of the two-piston, double-acting type, with four deliveries. From the pump, the oil is fed to an external transfer block and then, running in rigid steel pipe held in welded clips, it is passed to the centre and rear main bearings. The pipe leading to the rear bearing runs down the inside of the annular combustion chamber, but is screened by the rear-bearing support cone and tertiary air from the combustion itself. The front bearing is fed through drilled passages in the air-intake casting.

As previously mentioned, each bearing is supplied with ½ pint of oil/hour through a separate feed. At present, there is no oil recovery and all the hot, used oil is dumped overboard. Oil from the front bearing is drained through the "seven o'clock" strut in the compressor intake, and the flow from bearings 2 and 3 is passed out as mist and finally vapour through the jet pipe.

Another half-pint/hour is fed to the front accessories and drives, and is also drained overboard: total delivery is therefore 2 pints/hour. Some earlier engines had provision for a saddle oil tank around the front of the compressor, but the tank is elsewhere in the Jindivik. Various types of lubricant have been used with the Viper, but by far the best performance has been obtained with the synthetic Esso Turbo-oil 35, and this is considered standard.

Starter.—The original idea was that the Australians would make a portable starter unit which would be manually held up against the fuselage of the Jindivik, to engage mechanically with the drive shaft in the "three o'clock" intake web. It was soon apparent that this method was fraught with difficulties, chiefly owing to the impossibility of getting accurate alignment. Armstrong Siddeleys suggested a direct air system in which a compressed air jet is directed against the turbine blades. This has now been adopted, and is shown in an accompanying drawing.

Air is taken from external bottles—or a test-bed air line—at 120 lb/sq in., and passed to a pair of ½in pipes on the turbine manifold, blowing tangentially at 30 deg to the tips of the turbine blades. The Viper is not at present a fighter engine and has not had to meet the "10 seconds" starting time requirement. Nevertheless, the Viper accelerates very well from rest to about 2,000 r.p.m. at which point the engine pulls away. Idling speed of 5,500 r.p.m. is reached in about 35 seconds. The starting air line has a remote valve control and the engine has merely a non-return valve to stop air blowing out when the line is broken.

Accessories.—The Jindivik is, as might be expected of a pilotless aircraft, all-electric. Consequently, present Vipers carry no accessories apart from a generator, and this, being a product of Rotax, Australia, is bolted on in that continent. It has a capacity of 1½ kW, and is blast-cooled by ram air. Interest attaches to its drive, which consists of an internal gear driven from the front of the compressor, and situated just forward of the front bearing.

The Present Position.—In order to complete preliminary testing quickly, Armstrong Siddeleys first built six development engines. A number of production engines have now been made of the ASV.3 type, cleared for 25 hours flight.

In the meantime, the Jindivik 1 is completing its trials with the Adder, and the Viper-powered Jindivik 2 should fly in the autumn. The Vipers so far built have been painted with inhibiting fluid and sealed in tin-lined boxes containing silica gel desiccant, and then crated and shipped to the D.A.P. in Melbourne. Here, they have been fitted with the appropriate Australian-built components, and mounted in Jindivik airframes. The Australians have quite a stockpile of Vipers now, and it is hoped to get four to five flights per aircraft without any overhaul being necessary. In fact, it appears now that the short-life character of the Viper is greater than that of the airframe, for the Jindivik is likely to be written off before the engine life expires.

The ASV.5, on the other hand, is being developed as a perfectly normal engine for piloted aircraft, and should have a life fully equalling that of any other turbojet. It resembles the ASV.3 but is generally strengthened; the combustion chamber, for example, has flame tubes with a corrugated periphery, each corrugation being spot-welded to the adjacent flame tube section. Heavier gauges of sheet are being used over most of the engine, and a number of other detail alterations incorporated. These changes are likely to increase the weight of the long-life Viper to some 450 lb, but this is counter-balanced by a probable future increase in thrust.

At present, Armstrong Siddeleys are building an ASV.5 prototype and are developing the engine for use in the Percival P.84 jet Provost; for this application, at least, the Viper should have plenty of thrust in hand.

Finally, it is worth noting that the French private aircraft firm of Marcel Dassault have become very interested in the long-life ASV.5 and a licence has been agreed by which they will build and develop this Viper for their own airframes. They now have two short-life ASV.3s in order to gain some experience of this neatest of all power plants.

The Vipers so far cleared for publication are: the ASV.1 (1,145 lb thrust), ASV.2 (1,575 lb), ASV.3 (1,640 lb), ASV.4 (1,750 lb), ASV.5 (1,640 lb), and the ASV.6 (1,900 lb).

Following is a list, provided by the engine manufacturers, of the principal suppliers of material and components.

W. T. G.

SUPPLIERS OF MATERIALS AND COMPONENTS

Forgings.—Geo. Turton Platts and Co., Ltd. (compressor rear shaft); Tubes, Ltd. (turbine mainshaft); Firth Vickers Stainless Steels, Ltd. (turbine stator shroud).

Castings.—High Duty Alloys, Ltd. (air-intake body, compressor casing, front diaphragm, front bearing housing, gearbox body and cover, and other parts); Fozel Castings Co., Ltd. (oil-connection body); J. H. Lavender and Co., Ltd. (drain-valve bodies).

Stampings.—South Wales Forgemasters, Ltd. (turbine disc); High Duty Alloys Ltd. (compressor rotor discs); Daniel Doncaster and Sons, Ltd. (internal gears); Faulkners, Ltd. (seal ring housing); Dudley Drop Forgings, Ltd. (locknut); Brett's Stamping Co., Ltd. (oil seal housing).

Blading.—High Duty Alloys, Ltd. (compressor rotor blades); Firth Vickers Stainless Steels, Ltd. (turbine blade material); Brunton's (Musselburgh), Ltd. (formed strip for compressor stator blades and turbine inlet guide vanes).

Bought-out items.—Hoffman Manufacturing Co., Ltd. (bearings); The Palmer Tyre, Ltd. (flexible pipe), Pilgrims Way Motor Co., Ltd. (4-delivery metering oil pump); Lucas-Rotax (Australia) Pty., Ltd. (generator and electric actuator for Jindivik engines); Coopers Mechanical Joints Ltd.; Alfred Roberts and Sons, Ltd.; Super Oil seals and Gaskets, Ltd.; Stillwell and Sons Ltd.; James Walker and Co., Ltd.; British Piston Ring Co., Ltd.; Automotive Engineering Co., Ltd.; Precision Rubbers, Ltd.; Benton and Stone, Ltd.; A. Poole and Son; Mole and Son; Simmonds Aerocessories, Ltd.; and Fletcher Bros. (Pressings) Ltd. (breathers, grommets, oil seals, nameplates, washers, piston rings, circlips, bushes, tubing, sleeves, nuts, shims, tabwashers, and retaining tabs, etc.).

Sub-contract items.—Joseph Lucas, Ltd. (fuel system and controls); Joseph Sankey and Sons, Ltd. (stator-blade rings, combustion chamber, flame-tubes and jet-pipe); Metropolitan Vickers Electrical Co., Ltd. (machining of turbine blades), Tungum Co., Ltd. (rigid fuel-pipe units).

NAVAL VARIETY

Contrasting Pairs Seen at the Recent Ford Air Day

"FLIGHT" PHOTOGRAPHS

This line-up of Westland Wyvern S.4s is part of No. 813 Sqn. Recently converted from the Firebrand, the squadron pilots are well pleased with their powerful new strike aircraft.

(Left) A section of Supermarine Attacker FB.2s gets away from H.M.S. "Peregrine"; the Mk has a heavier canopy and, unlike the Mk 1, is a fully equipped fighter/bomber. (Right) This Hawker Sea Hawk F.1 is from Lt.Cdr. Pat Chilton's "Ace of Diamonds" Squadron (806) of aerobatic fame.

A lesser-known type is the Hawker Sea Fury T.20 trainer. (Right) Two of the Fleet Air Arm's many Gloster Meteor T.7s. (Below, left) The Percival Sea Prince C.1 is frequently employed as an "Admiral's barge." (Below, right) Beech Expediters are still in use for communications duties.

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns; the names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

In Perpetuation

THE letter in your issue of July 17th, from Mr. Geoffrey Dorman, suggesting that the name of Sopwith should be honoured for all time by naming one of our major airports after him, will, I feel sure, be supported, throughout the length and breadth of this fair land of ours—which would now have been a German colony had it not been for Sopwith and his great designer Camm.

No honour can adequately repay this tremendous service to this country and the Commonwealth, and I would like to suggest that, in addition to Alcock and Brown, the name of Sopwith should be added to the list of the great pioneers of British aviation whose work is deserving of being commemorated in this manner.

The others are, of course, de Havilland, who built the first airliner to fly a scheduled service to Paris, and Handley-Page, who built the first twin-engined multi-passenger machine. Both have followed on with a long line of successful aircraft which through the ages have kept Britain in the forefront of world aviation. The name of A. V. Roe also merits serious consideration.

One other name crops up—that of Cody, who carried the first three passengers—two strap-hanging and one in the seat—on February 4th, 1911, and flew the first five-seater in 1912. In this case I think that Farnborough Aerodrome should be called "Cody Airfield," to commemorate the first flight made by man in this country, following the example of the United States, who have named Simms Station, at Dayton—where the Wrights carried out their main experimental flights—"Wright Airfield."

Cody made five flights at Cove Common, on May 16th, 1908. These were the first flights in this country. He moved to Laffan's Plain—the present Farnborough Aerodrome—the following May and carried on (at his own expense) from there. He made the first one-hour cross-country flight from Laffan's Plain on September 8th, 1909, but as he had a French engine he could not compete for the valuable prizes for all-British machines, and consequently was severely handicapped for funds to pursue his experiments.

I agree that the Comet prototype machine should be preserved, and not scrapped; but, as they have a museum at Hatfield, it is possible that they may want it at the place of its birth.

Virginia Water, Surrey. G. A. BROOMFIELD.

Where Helicopters Stop

ONE thing is quite certain about helicopters, termini for the same, etc. This is that helicopters are aircraft. Why, therefore, search for any new name? Why, in the interest of normalizing this form of transport, not just use the name "airport" and have done with the nonsense? I do not think anyone has ever suggested that an aerodrome licensed only for light aircraft is differentiated, in its civic title, from one capable of accommodating the Brabazon. It seems to me silly to differentiate between a place for landing a rotary-wing aircraft from one for a fixed-wing type. Who knows? In twenty years' time it may all be one.

London, W.1. PATRICK JOHNSON.

The S.E.5

CONGRATULATIONS to J. M. Bruce, M.A., on his brilliant "historic military aircraft" article No. 5, which dealt with the above-mentioned type.

Having been employed by the late Maj. Jack Savage's organization in England, and later in America (1920-1924), I feel that the following additional particulars may be of interest, particularly to old-timers:—

(1) Maj. Jack Savage, the inventor of skywriting, did not fly an S.E.5.

(2) Capt. Cyril Turner was the original skywriting pilot; Capt. "Dopey" Lingham was No. 2.

(3) Only one aircraft was modified by the Skywriting Corporation of America, and this was just a temporary job of streamlining for a particular race meeting.

Jersey Airport. GEORGE COOK.

Missing Mossies

THE Fly-Past and static display for the Royal Air Force at Odiham were of a most impressive nature and it was pleasant to find such comparatively large numbers of aircraft in one place at one time. However, although nearly all sections of all commands were represented in some form, what about the photographic reconnaissance squadrons that now so sensibly belong to Bomber Command? After all, there were obsolescent Coastal Lancasters in the static show, while even the Auster and Prentice were present, yet no room could be found for so famous a machine as the Mosquito.

The Mosquito is not dead, for it is still in squadron service at home and overseas; so surely a flight of three or so should have completed an otherwise well-finished picture?

The R.A.F.'s last Hurricane and a flight of Spitfires also would have been welcome additions.

Elstree. Ex. P.R. MOSQUITO PILOT.

But Not At Farnborough

WHILE I am in agreement with your correspondent Mr. Angel (*Flight*, July 24th) with regard to seeing foreign aircraft over here, I do not agree that the S.B.A.C. Display is the place where we should see them. What is required is a display on the lines of those organized by the *Daily Express* at Gatwick, but with stronger U.S. and Continental participation.

London, N.W.6. E. WATTS,
Chairman, Executive Committee, Air-Britain.

Aerial Top-Dressing

WITH reference to your article "Aircraft Help N.Z. Farmers" (*Flight*, April 10th, 1953) I should like to add the enclosed information and correct some small errors. Loading time for aircraft (i.e., Tigers), from wheels stopped to wheels rolling, seldom exceeds 40 sec. The unofficial record for one pilot, one Tiger, in one day, is in the region of 40 tons of fertilizer. Working under fairly difficult conditions with a 300-ft climb to target area, two aircraft spread 11 tons on my farm in 1 hr 36 min. This fertilizer also had clover seed mixed in for oversowing of eroded hillsides.

Best wishes to you and your excellent journal.

Waipukurau, N.Z. WALTER S. MATTHEWS.
(ex-614, 616 and 487 Sqns.).

[Mr. Matthews encloses newspaper cuttings reporting a meeting of the Aviation Industry Association in Wellington, at which it was stated that N.Z. acreage top-dressed from the air increased from 47,000 in the year ended March 31st, 1950, to 1,376,118 in the year to March 31st last. Accidents on agricultural flying operations fell from 58 to 45 between 1950-51 and 1952-53, although flights increased from 335,900 to 488,712.—ED.]

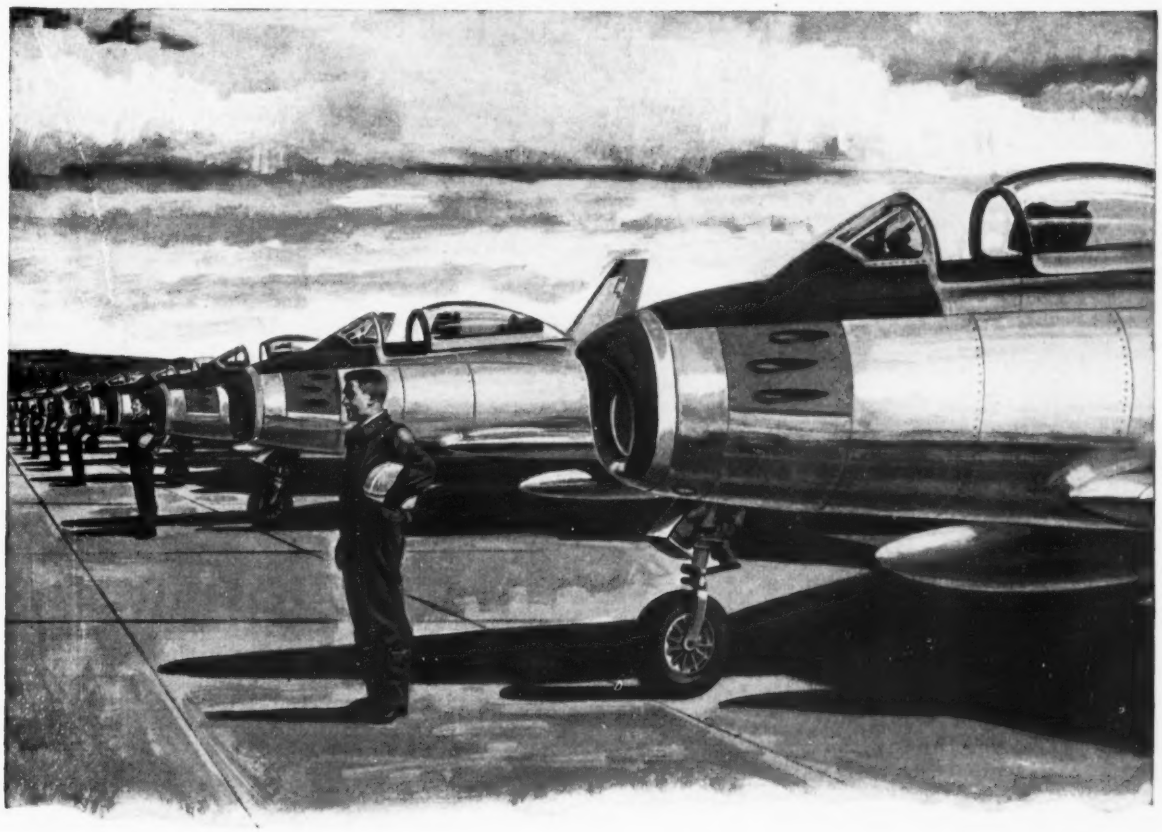
"Some Russian History"

I WOULD like to congratulate you on publishing Mr. Allward's article (July 17th) on Russian pioneering work in aviation. Far too often Russian claims to have achieved serious technical advances before 1917 are dismissed in our Press with a shrug and a sneer. Yet an enormous amount of research has been done by technical historians in the Soviet Union in recent years, and they have undoubtedly unearthed a mass of interesting material which had lain buried for decades owing to the backwardness of the Tsarist Government in assisting scientific developments, and also to the weakness of Russian industrial capital in financing the brilliant inventors who undoubtedly did exist and work "unaided" under Tsarism.

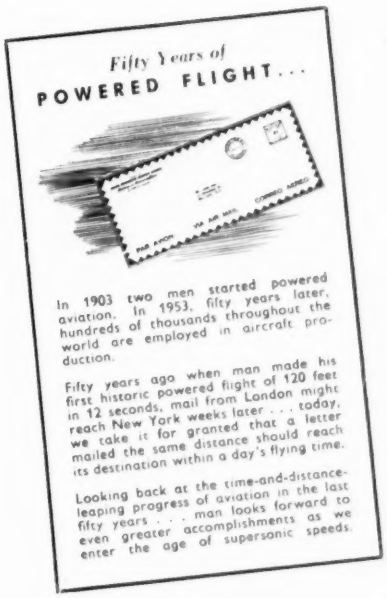
London, E.C.1. PAT SLOAN.
Gen. Sec., British Soviet Friendship Society.

FORTHCOMING EVENTS

Aug. 8-13. Round-Switzerland Air Tour.
Aug. 22. A.T.A. Association: A.G.M. and Reunion, White Waltham.
Aug. 22. Coventry Air Day and Siddeley Challenge Trophy Race.
Aug. 29. Vintage Aeroplane Club: Rally, White Waltham.
Aug. 30. Aero-club d'Italia: Pescara Rally.
Sept. 3-5. Chester Searchlight Tattoo (R.A.F. Night, Sept. 4).
Sept. 3-10. Aéro-Club de Cannes: Cannes Grand Prix.
Sept. 6. S.M.A.E.: "Yorkshire Evening News" Model Flying Festival, Sherburn-in-Elmet.
Sept. 7. S.B.A.C. Farnborough Display and Exhibition: Technicians' Day.
Sept. 8-10. S.B.A.C. Farnborough Display and Exhibition: Private Invitation Days.
Sept. 11-13. S.B.A.C. Farnborough Display and Exhibition: Public Days (Public première, Friday, 11th).
Sept. 12. "At Home," R.N. Air Station Eglinton.
Sept. 14. R.Ae.S. Wilbur Wright Memorial Lecture: "Structures," by Prof. N. J. Hoff, F.R.Ae.S., F.I.Ae.S.
Sept. 14-17. R.Ae.S. and I.Ae.S.: Anglo-American Aeronautical Conference.
Sept. 15. Battle of Britain Day.
Sept. 19. "At Home," R.N. Air Station Abbotsinch.
Sept. 19. R.A.F. At-Home Day.
Sept. 20. St. Albans Model Aero Club: All-Britain Model Rally, Radlett.
Sept. 20. Aero Club de Milan: Milan Grand Prix.
Oct. 8. Start of England-Christchurch (N.Z.) Air Race.
Dec. 17. Anniversary of the Wright Brothers' First Flight.



"On Time" Deliveries COUNT — AT CANADAIR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For further information: European Representative, J. H. Davis, Princes House, 190 Piccadilly, London, W.1., England.

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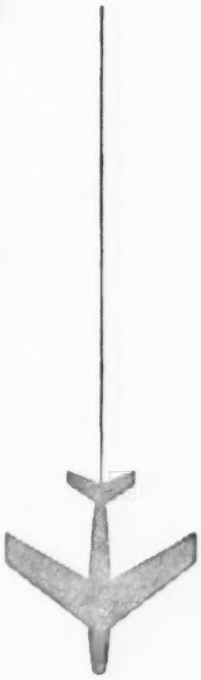

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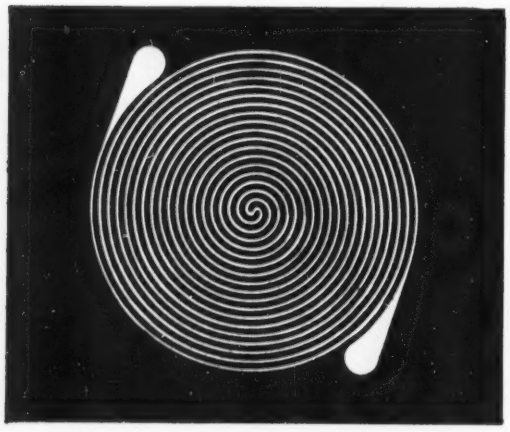

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THE AERONAUTICAL BOOKSHELF

"On being a Bird," by Philip Wills. Max Parrish, Rathbone House, London W.1. Illustrated. Price 15s 6d.

FOR twenty years Philip Wills has devoted his spare time to gliding, and has been so consistently successful that it was with pleasure rather than with surprise that we learned of his victory in the 1952 World Gliding Championships. When gliding started seriously in Britain in 1930, Wills owned a private aeroplane, but he soon gave it up in favour of a sailplane. His gliding adventures in this country, in South Africa (where he joined vultures in their soaring), among the snow-covered peaks of Switzerland, high above the sunbaked Spanish plateau, and inside the very wet, cumulo-nimbus clouds of England—all these are described vividly and with great good humour in this book.

Glider pilots will have read some of these accounts before, but they are here collected and linked by an appropriate mixture of anecdotes and technical description to appeal not only to gliding folk but to all who love flying. There is the astonishing story of sailplanes being towed out across the English Channel by Avro 504s during the Battle of Britain. Also told for the first time is the story of the fateful day in July 1948 when Christopher Nicholson and Donald Greig lost their lives while gliding among the Swiss Alps. The author's tribute to his friends is especially moving. On the lighter side, the story of the missing speleologist, with which the book begins, emphasizes that gliding is normally an amusing pastime—if an odd one. In concentrating on the adventures of the sailplane pilot we must not forget the invaluable part played by the helpers on the ground—especially the trailer driver; Mrs. Wills covers at least three miles for her husband's one and the dedication is a tribute to her efforts.

Readers of Philip Wills' book will find that there is much which can be learned from flying the slow and quiet aeroplane—even by pilots of the fast and noisy.

"Prelude to Space," by Arthur C. Clarke. Sidgwick and Jackson, Ltd., 44 Museum Street, London, W.C.1. Price 9s 6d.

IT seems hardly just to describe Arthur Clarke's latest novel as "science fiction." This time there are no winsome little Martians or long-leggity Moon-dwellers to capture the readers' imagination. Instead, he has woven his story around preparations for launching the first piloted moon-rocket from the Australian desert in the year 1975.

Despite the absence of an involved "plot," *Prelude to Space* is a readable little book, from which the uninitiated will learn much about the problems of space-flight and how they may be solved. One is almost tempted to write "how they *will* be solved." for Arthur Clarke is chairman of the British Interplanetary Society and his space-rockets are always logical and convincing, because they reflect the latest scientific theories on the subject.

This time his space-vehicle—the *Prometheus*—is an atomic-age version of the Short-Mayo composite aircraft, in which a small, bullet-shaped interplanetary rocket is carried to the upper atmosphere atop a giant 18,000 m.p.h. delta-wing aircraft. Both are, of course, atom-powered; and it is reassuring to learn that they are a real United Nations effort, resulting from a decision that there must be no frontiers in space!

Indeed, the only note of discord comes when a religious maniac attempts to destroy *Prometheus* because he believes that any attempt to enter space would bring down upon humanity some stupendous metaphysical doom. He succeeds only in destroying himself, by hiding in a place that makes the front end of a jet-engine at full throttle seem as innocuous as a children's playground.

"Across the Parallel," by George Odgers. William Heinemann Ltd., 99 Great Russell Street, London W.C.1. Illustrated. Price 21s.

WHEN one reads in the newspapers that a young Australian pilot named Kenneth Murray has set up a record by completing 333 combat missions in jet fighters over Korea, it is easy to dismiss the feat as a somewhat meaningless product of a phoney war.

And the Korean War has been phoney in some respects. In a total war, carrier-based squadrons could not operate freely over targets protected by enemy aircraft and submarines; and United Nations troops could not deploy with so little fear of air attack. But neither would United Nations fighters have to fly long distances to battle with superior forces of Migs that need only fight when conditions are in their favour and can squat at other times wing-tip to wing-tip on their airfields in complete safety. Nor can air power be regarded as an over-rated tactical weapon because it has sometimes failed to stop advancing armies of Chinese soldiers, carrying only a rifle and bowl of rice hundreds of miles over mountain trails, without vehicles or artillery, mostly at night. And there is, unfortunately, nothing phoney about the casualty lists.

This story of the achievements and experiences of No. 77 Squadron, Royal Australian Air Force, in the Korean War, from June 1950 until the autumn of 1952, helps to put the Korean air fighting in its true perspective. It was written by an Australian Air Force P.R.O., chiefly for Australians, and is a little parochial; but it is a record of which the Empire as a whole can be proud.

No attempt is made to hide mistakes. There are tragic instances of Australian and American aircraft shooting up friendly troops—an obvious pointer to the need for better methods of identification of ground forces—and the shortcomings of the veteran Meteor as a Mig-hunter are given equal prominence with its popularity and effectiveness as a ground-attack aircraft—although this has not stopped the Australians shooting down a few Migs. Tribute is paid to men of all the other United Nations—to Commonwealth, American and Turkish infantry, the long-suffering South Koreans, the gallant crews of Harvard target-marking "mosquitoes," and the helicopter pilots who have evacuated over 21,000 wounded. And it succeeds admirably in its main purpose of putting on record the superb heroism and sacrifice of the men of No. 77 Squadron, without any unnecessary jingoism.

"Album of Aviation," by Edward L. Throm and James S. Crenshaw. Popular Mechanics Press, 200 E. Ontario Street, Chicago 11, U.S.A. Illustrated. Price $3.00.

INEVITABLY, the 50th anniversary of the first controlled and sustained flight in a powered aeroplane will produce a rash of aviation histories this year, some of them rasher than others. As a picture book, this particular *Album of Aviation* is a useful addition to any reference library, because an unusually high proportion of its 200 illustrations will be new to British readers, including some real gems from issues of *Popular Mechanics* magazine published in the first decade of this century.

Unfortunately, the whole thing is marred by insufficient care in checking facts, figures and spellings in the text. A casual glance through the book will reveal a score of irritating inaccuracies. For example, the first pilots to fly from England to Australia are given as "Capt. Ross Smith and Lieut. Keith Muth"; the Super-Constellation is called a "Lockheed turboprop fighter"; United States jets are credited with speeds of around 600 m.p.h. in 1942—yet we are told that America, England and Russia went to work on the problem of jet and rocket-powered flight only after capturing German rockets and research scientists in 1945.

If only the publishers had realized that aviation books must be written by people with a sound, specialised knowledge of the subject, this would have been an unusually valuable addition to aeronautical literature.

OTHER BOOKS RECEIVED

The Sea Shall Not Have Them, by John Harris. Hurst and Blackett, Ltd., Stratford Place, London, W.1. Price 9s 6d.

Thrice Your Own, by Margaret Morrison. Hutchinson and Co. (Publishers), Ltd., Stratford Place, London, W.1. Price 10s 6d.

Celestial Navigation for Yachtsmen, by Mary Blewitt. Iliffe and Sons, Ltd., Dorset House, Stamford Street, London, S.E.1. Price 5s. This new edition of a little book which is well known to yachtsmen is intended especially for the beginner. The system of working out a sight is based on R.A.F. navigational practice.

Rockets, Jets, Guided Missiles and Space Ships, and *By Space Ship to the Moon*, both by Jack Coggins and Fletcher Pratt (Nos 1 and 2 of the "Space Adventure Books"). Publicity Products, Ltd., Adprint House, 51a Rathbone Place, London, W.1. Price 4s 6d each.

A.B.C. Military Aircraft Recognition 1953 and *A.B.C. Civil Aircraft Recognition*, both by John W. R. Taylor. Ian Allen, Ltd. Price 2s 6d each. These newest of Mr. Taylor's distillations are just right for carrying on the hip as quickly absorbed sources of dependable information. The pictures are clear, the silhouettes are neatly drawn, and the notes bespeak the author's first-hand knowledge of spotting technique.

Radio Designer's Handbook (4th edition), edited by F. Langford-Smith, B.Sc., Iliffe and Sons, Ltd., Dorset House, Stamford Street, London, S.E.1. Previous editions have achieved exceptional success throughout the world. The work deals in detail with basic principles and the practical design of all types of modern radio receivers, audio amplifiers and record-reproducing equipment. This fourth edition is more than four times as large as the previous edition and is the work of ten authors and 23 collaborating engineers.

SIKORSKY S-52 SERIES

A Successful Little Helicopter and its Background

A Sikorsky S-52-2 three/four seater which carries full dual control. Note the two ventral fins and the tail-boom stabilizer.

ALTHOUGH little known in Great Britain, the Sikorsky S-52-2 has earned for itself in the U.S.A. a well-deserved reputation for being a great little helicopter. It has been used extensively in Korea as a rescue machine for the evacuation of wounded, and as a command transport vehicle. In these capacities it has ably demonstrated that the comprehensive background of research behind its production has resulted in flight characteristics of which its makers may be justly proud.

Analogies have been drawn between the helicopter and the horse; it is not without precedent, therefore, that the pedigree of the S-52-2 should be examined in equestrian terms. Sired by the S-52-1, of 1948 vintage, it had its origins in the stable which produced a helicopter that was for a number of years the mainstay of rotating-wing flight, the Sikorsky R-4. In fact, it was the R-6A series which was born directly out of the R-4; but this series, although it achieved a high quality of rotor control, suffered numerous drawbacks—associated with maintenance—which made it clear that a re-design was necessary.

Thus the S-52-1 emerged, incorporating all the lessons learned from the R-4 and R-6 series, together with many features of its own, and it showed its worth quite early in its development by establishing a new world helicopter speed record of 129.8 m.p.h.

As may be expected, it is from improvements in rotor head design that the S-52 derives its pleasant handling characteristics. The basic change involves the location of the blade flapping hinges so that their action is coincident with the drag hinges. This results in a decreased control lag and also allows greater range of control. Movements of the stick are light and easy, and the response in the machine is lively and accurate.

Shortly after gaining the speed record, the little two-seater demonstrated its manœuvrability, during the course of a routine test flight, by performing a series of successive "loops," gaining height slightly after each in the approved manner. The pilot was Harry Thompson of Sikorsky's flight-test department, and the date was May 9th, 1949. Later he repeated the performance—carrying Ralph Alex, then project engineer, as passenger.

From that time development proceeded steadily. A project was then already in hand to enlarge the cabin space to provide three/four seats, and thus utilize the Franklin engine's 245 b.h.p. in a more practical manner.

The enlarged version, designated S-52-2, was granted its C.A.A. certification in the early part of 1951. A few civil machines were built, but the main production up to the present has been for the U.S. Navy; the type has been designated HO5S-1. The machine is officially classified as a "three-place" helicopter but a fourth occupant can be carried on shorter flights. The large fuel-tankage capacity allows for 60 American gallons (50 Imp. gallons).

With a pilot and three passengers aboard sufficient fuel can be carried for a flight of approximately one-and-a-half hours—or a distance of between 120 and 140 miles at the cruising speed of 95 m.p.h. With only three occupants the fuel tank may be filled, giving an endurance of 3½ hours and a range, with fuel reserves, of 330 miles. This "built-in alternative" increases the machine's versatility and has been proved to be of much practical value in the field. For delivery flights, auxiliary fuel tanks may be fitted to provide for a maximum distance of 800 miles with pilot only aboard.

In its rôle as a rescue helicopter the S-52-2 normally carries two stretcher cases alongside the pilot. The canopy opens forward, in a manner reminiscent of the Bristol Freighter, to allow ease of loading and unloading.

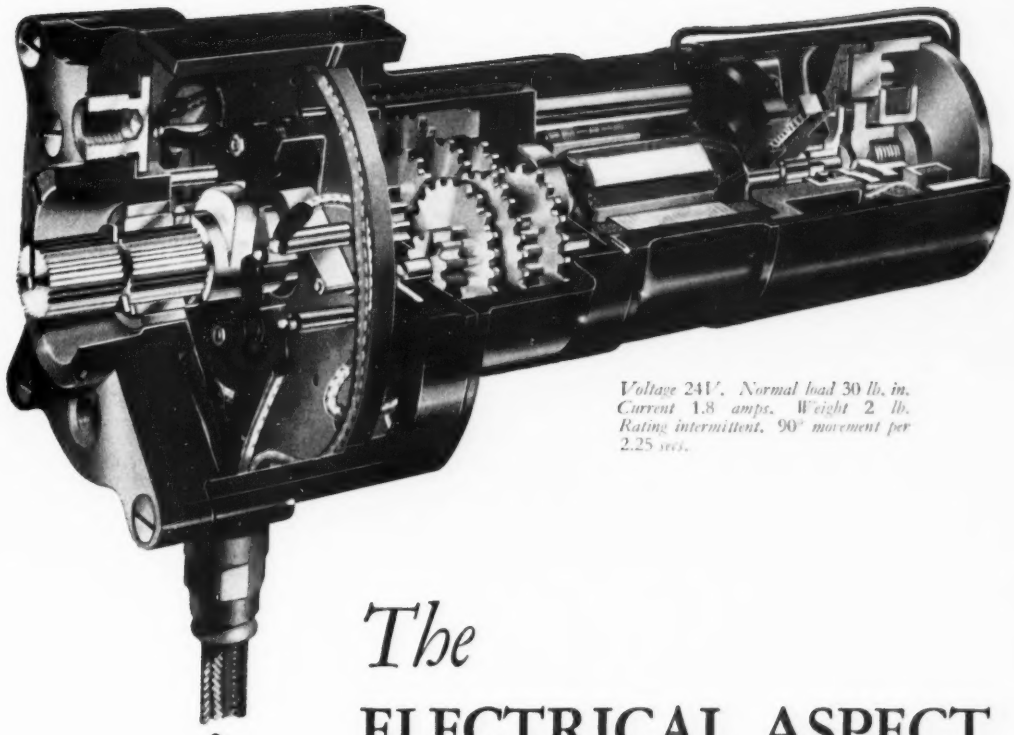
Improvements in stability have been effected by the addition of large ventral stabilizing fins to the tail boom. These fins are fixed surfaces, as they have recently been so made on the American S-55. In earlier versions of the S-55 the fins were adjustable by the pilot to provide fore-and-aft trimming in flight, but this is no longer necessary. Additional vertical fin area has also been provided by an extended fairing on the tail-boom elbow to compensate for the increased keel surface forward of the rotor pylon with the longer nose.

The use of a high-speed rotor allows a wide range of permissible rotor revolutions in flight, which is of particular advantage in the autorotative-landing case. Where an engine-off landing with zero forward speed is desired, it is possible, by using the kinetic energy stored in the rotor, to hover the machine momentarily in the flare-out before touching down. The touch-down itself is perfectly steady with the quadricycle landing gear.

Of the many features embodied in this admirable little helicopter, the most important is undoubtedly the metal construction of the rotor blades. These blades were originally incorporated on the S-52-1 and now have had five years of flight experience on the series. The main spar is an alloy extrusion which is itself the leading edge of the blade. The trailing edge is made up in sections, each of which is attached to the spar individually. Thus the sections towards the blade tip are relieved of carrying the centrifugal load exerted on the inner sections, resulting in greater overall strength. The blades are fully interchangeable and their uniformity is a considerable contribution to the smoothness of the machine in flight.

The S-52-2 is a happy compromise in size between the small two-seater helicopter, the utilization of which is rather limited, and the somewhat larger 4/5-seater machine in the 500 h.p. class. The latter is often uneconomical for many charter operations. The current military versions are in use by the U.S. Army, Coast Guard and Marine Corps, but the series has now been returned to the stable for another "breeding" spell while further power-plant research and development is carried out. When the new "filly" eventually emerges it is to be expected that it will uphold the reputation of its distinguished forbears. B.H.A.

A stretcher case is loaded in Korea with rotors still turning. The port-side sliding door facilitates stretcher-loading.



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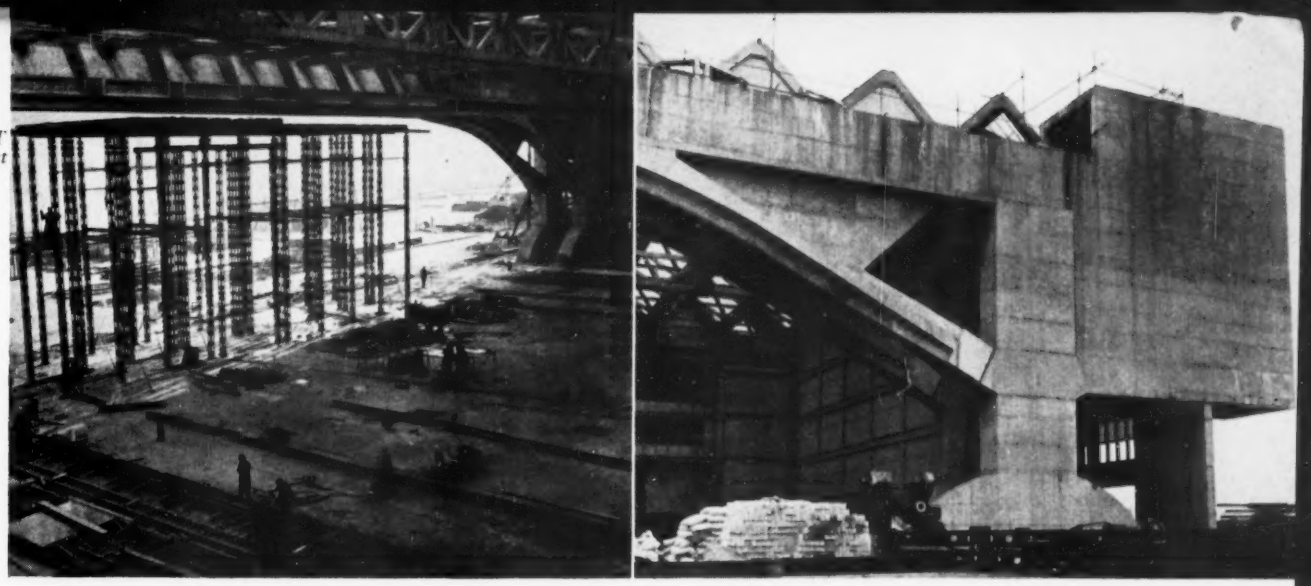


B.O.A.C.'S NEW BASE: Two aspects of the new B.O.A.C. engineering base under construction at London Airport, parts of which will be occupied early next year: (left) one of the 50,000 sq ft hangar bays, showing installation of the zig-zag under-floor pipes through which superheated steam will pass; (right) at each corner of the bays is a massive 1,000-ton counterbalance for the cantilever carrying half the load of a 150ft concrete arch.

CIVIL AVIATION

THE JAN SMUTS AIRPORT

ON Saturday last, August 1st, the Jan Smuts Airport (mid-way between Johannesburg and Pretoria) was to have been officially opened. Of this occasion, Sir Miles Thomas, chairman of B.O.A.C., says "Jan Smuts Airport is indeed a fine example of South African initiative and enterprise. It holds a high place among airfields of the world, both in its conception and construction, and it is a symbol of South African determination to be in the forefront of modern developments.

"For a considerable time, B.O.A.C. has been using the Jan Smuts Airport for its Comet services. In fact, it was the construction of Jan Smuts that made possible the inauguration of our Comet services on the route between London and Johannesburg. I am sure that the opening of this new airport will be warmly welcomed by the airlines who will use it, not least by B.O.A.C."

On September 1st all air services previously operated to and from the temporary airport at Palmietfontein (which has been in use since 1945) will have been transferred to the new airport.

FURTHER SOUTH AFRICAN NEWS

SOUTH African air charter operators have shown concern at a letter sent by the National Transport Commission to a Johannesburg charter company. In this, the company was informed that the Commission intended to prohibit the carriage of passengers or goods by the company to and from the goldfields area of the Orange Free State. If this particular ban is enforced. the charter companies fear that similar action may be taken on other routes and that they may be forced out of business. The company concerned was expected to express its objection to the ban before a meeting of the National Transport Commission in Pretoria.

Another new national airport is under construction at Bellville, Cape Town. Situated in a fog-free area, on level country, this airport will become a main terminal for all air services in the Cape. The main runway is 2,200 yd long and 150 yd wide, and at present several other runways and the terminal area apron are also under construction. It is expected that this work will be completed by the end of February, 1954.

B.O.A.C. BOOKINGS BOOM

AN exceptionally heavy demand for seats was reported by B.O.A.C. last week. Not only were Comets leaving for South Africa and Eastern destinations with every one of their 36 seats filled, but comparable load factors were being experienced on the North Atlantic route. The boom is partly accounted for by the fact that fewer business men flew abroad during the Coronation period and that child passengers going abroad for school holidays are adding to the seasonal traffic. The Corporation reports, however, that these classes of traffic did not completely account for the fact that B.O.A.C. are carrying more passengers than ever before, since exceptional loads are also being carried on several inward flights. The average load factor, for example, for 67 services in and out of London Airport on three recent successive days was 77 per cent.

ANOTHER VISCOUNT RECORD

ONE of B.E.A.'s Viscounts (R.M.A. *George Vancouver*) set up the fifth route record gained by this type of aircraft when, on July 28th, it flew from London to Copenhagen at an average speed of 299.5 m.p.h. By completing the journey in 121 min 53 sec, it cut over half an hour off the normal time. The aircraft, operating a normal scheduled service with 46 passengers aboard, was commanded by Captain R. F. Noden. Previous Viscount route records have been set up on the London-Cologne, Cologne-London, Zürich-London and London-Geneva routes.

U.K. AIRPORTS IN JUNE

THE number of movements at U.K. aerodromes in June was 23,600, approximately 16 per cent more than in the corresponding month of last year, and passenger traffic went up by 22 per cent to a total of 383,000 for the same period. Due largely to the traffic boom on the cross-Channel ferry, the amount of freight on- and off-loaded increased by no less than 97 per cent to 7,700 short tons. There was a slight increase in the amount of mail handled, tonnage for the month being 1,110.

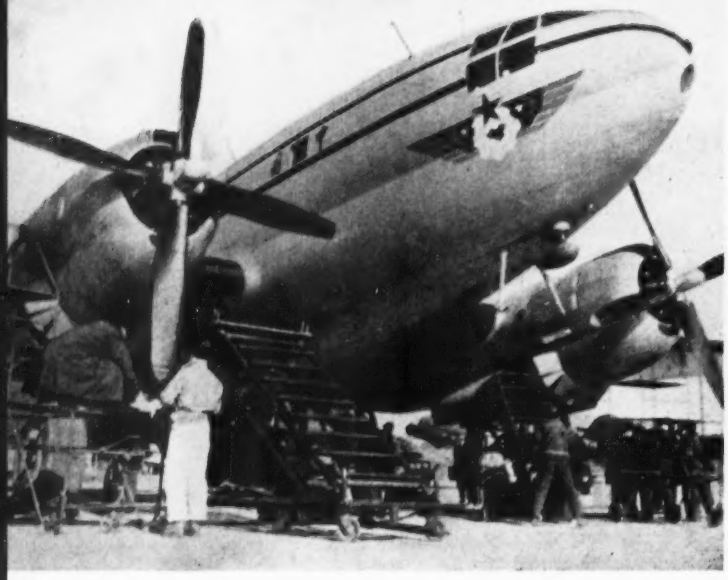
B.E.A.'s gradual transfer of services from Northolt to London Airport is beginning to affect traffic figures at the former terminal: the number of movements there in June was 3,800, 12 per cent less than in June, 1952, and the number of passengers dropped by 9 per cent to 75,500. The month's movements at London Airport totalled 4,550 (a 45 per cent increase) and passenger traffic increased by 39.5 per cent, the total number of people who passed through the airport being 118,400. During the fortnight following the Coronation there were 53,200 passenger departures alone at London and Northolt. Impressive increases in passenger traffic were experienced at several British airports, including Lympne (308 per cent), Elmdon (64 per cent), Ringway (30 per cent), Renfrew and Turnhouse (each 28 per cent) and Southampton (23 per cent). The Channel Islands aerodromes handled 5,223 aircraft movements in June (an increase of 11 per cent) and 48,834 passengers, 1,400 more than in June, 1952.

PASSENGER TAX TO BE WITHDRAWN

THE withdrawal, next spring, of passenger service charges was announced to the House of Commons on July 29th by the Minister of Transport and Civil Aviation, Mr. Lennox-Boyd. This decision was recently forecast in a speech by Sir Miles Thomas.

Replying to a question by A. Cdre. A. V. Harvey (Con. Macclesfield), he said that the charge was introduced in May 1952 as a charge additional to the landing fee on airline operators to help meet the cost of services and facilities for passengers at State airports. It was on the basis of 5s. for each passenger leaving M.C.A. airports for overseas. It was hoped that this additional charge on the operators could be passed on to the travelling public by being absorbed into the fares.

However, I.A.T.A. had, for a number of reasons, not agreed to do this. Most British independent operators were willing to arrange for the charge to be paid by passengers when they buy their tickets; but neither the Corporation and main foreign airlines



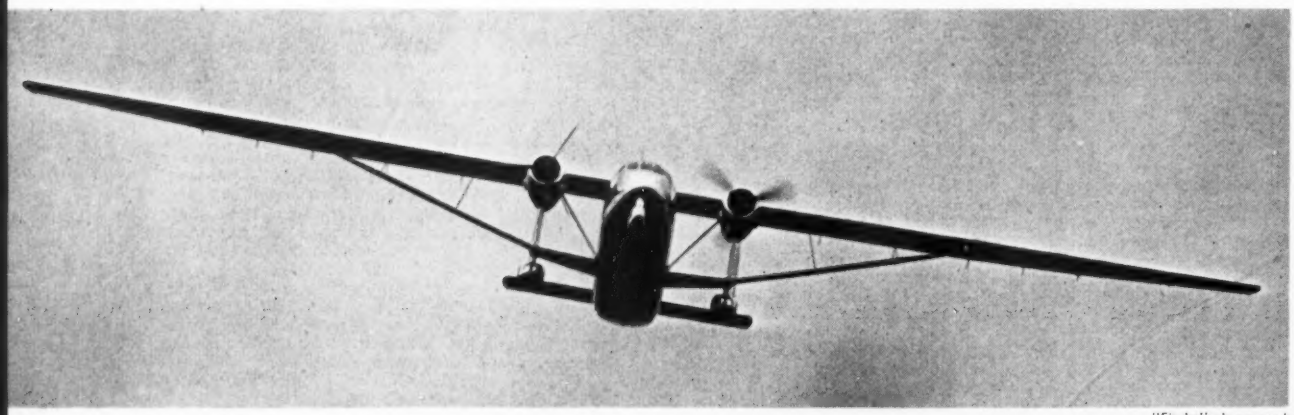
RARE BIRD: An airliner unlikely to be entered in the log of many collectors is this Curtiss C-46 of the Chinese People's Aircraft Corporation. The markings are mainly in red. As reported on the opposite page, El Al, one of the many airlines still using this type, are adding auxiliary jets to improve the performance of their Commandos.

CIVIL AVIATION . . .

(who between them carried most of the passengers using our airports and whose problems were admittedly different from those of the independants) nor the travel agents could arrange this.

In consequence, most airlines collected the charges from individual passengers as they left the town terminal or the airport. This caused inconvenience to passengers and, after most careful thought, the Minister had decided to withdraw the passenger service charges as such and to raise compensatory revenue by means of increases in landing fees. Adjustments to the landing fees were now being considered in consultation with the interests concerned, and the change would be introduced in the spring of 1954.

A. Cdre. Harvey's question was not reached in time for supplementary questions to be asked, but it may be taken that the Minister's announcement was welcomed by many Members who have some time protested severely against this particular imposition.



"Flight" photograph

HUREL HEAD-ON: Spanning nearly 150ft, the HD 31 makes an impressive picture, particularly with one of the 800 h.p. Wrights inoperative.

FLYING IN THE HUREL-DUBOIS

DURING the 20th Paris Aeronautical Salon [writes John Stroud] I was fortunate enough to fly in the Hurel-Dubois HD 31; in fact I was one of the first outsiders to do so. However, this story does not begin at that point. At the 1949 Salon in the Grand Palais I noticed a very high-aspect ratio monoplane model, thought it looked odd and passed on. That was my mistake. About a year later, on May 14th, 1950, to be exact, at the R.Ae.S. Garden Party at White Waltham, I saw the little HD 10 F-WFAN, aspect ratio 32.5, flying most impressively with little apparent means of support, at least in the sense that we have to come to accept it. Research has now tied up the little model and the HD 10—it was the ¼ scale wind-tunnel model tested at Toulouse.

My next encounter with the Hurel-Dubois aircraft and their paper-knife wings was in March this year, when I passed through Paris on my way from Algiers to London. Jacques Noetinger of the U.S.I.A. insisted on rushing me, at terrifying speed, to the Hurel-Dubois establishment on my way from Paris to Orly. I had ten minutes in the factory and arrived at Orly with one minute in hand.

In that ten-minute call I met Commandant Maurice Hurel, had a quick look at the HD 31 (which had made its first flight about six weeks earlier) and, dare I mention it, met M. André Péan, chief engineer of Air France on his way in as I came out. I brought away various interesting documents including one entitled *The Advantages of High Aspect Ratios*, an impression of a team of people who knew what they were about and a high opinion of the workmanship on the HD 31. I also glimpsed the fuselage of the HD 32 progressing nearby.

On arrival at this year's Paris Salon I sought and received Commandant Hurel's permission to fly in the HD 31, which was then making its first public appearance. The aircraft is at present unsoundproofed and unfurnished, containing mostly instruments, ballast boxes and a lot of space. The noise was terrific and up in its cathedral-like roof thin control cables could be glimpsed.

When Max Fischl opened up the two 800 h.p. Wrights, the aircraft began to roll and, after running about 900ft, the great structure leapt into the air and began its fantastic climb, passing nearly over the exhibition hall at the end of the runway at about 1,500ft. The take-off was made at a weight of about 27,500 lb (fully loaded weight is 29,762 lb) and the temperature at the runway was about 35 deg C.

We continued climbing towards Paris in what were quite turbulent conditions. In more orthodox aircraft it would probably have been a rough ride but in the HD 31 the fuselage rode smoothly while the great stretch of wing flexed merrily and absorbed the turbulence. Having seen the flexing to starboard and checked that the same thing was happening to port I settled down to enjoy the view, as there were too many people forward to allow penetration to the flight deck.

We made a couple of wide tours around the area with quite steep turns at each end and it was an impressive sight to see the great wing pointing at the ground or straight up towards the sky.

Coming in off one such turn and making a steep approach we pulled to a stop after running perhaps less than 900ft. I don't think we were more than 1,200-1,500ft from the runway threshold when we stopped. We didn't exactly fly back to our parking place but we did clear the runway at high speed and, during the great flying show on the following Sunday, Max Fischl did in fact fly the HD 31 from his touch down point to the end of the runway at a height of about 2-3ft.

This is a most impressive aeroplane and the HD 32, which is due to fly in November, should be even more so, with its two 1,200 h.p. Twin Wasps enabling it to be compared directly with the Dakota.

Operating costs for the HD 31 are 40 frs per tonne/km; in addition Commandant Hurel has plans for a large 60-ton transport powered by four Wright Compounds and carrying 30 tons of payload at 20 frs/tonne/km. I think we shall hear much of these aircraft and it is not improbable that some of what we hear may be connected with one of the world's major airlines.

RUSSIAN EQUIVALENT of the Viking, and the mainstay of Aeroflot's scheduled services, is the 27/32-seat Il-12, of postwar design. Over 40 are to be seen in this view from the terminal building at Vnukovo, Moscow's main airport; some are without the normal dorsal fin.

AUXILIARY JETS FOR EL AL

EL AL Israel Airlines, Ltd., have decided to improve the performance of their six Curtiss Commandos by fitting each aircraft with two auxiliary jet units beneath the fuselage. The type of power unit chosen is the Turboméca Marboré of 880lb thrust, which will use the same fuel as the Commando's piston engines. The work of modification will be carried out in the company's maintenance base in Israel. It is expected to result in improved take-off performance and payload increases of up to 20 per cent. An American freight company, the Flying Tiger Line, has been experimenting with a Commando fitted with one of these units.

BREVITIES

WITH the exception of Kingsford Smith Airport at Sydney, all Australian air terminals are being renamed after the cities and towns to which they are adjacent—a logical policy which seems likely to be followed elsewhere.

* * *

A DC-4 of Canadian Pacific Airlines recently made the first non-stop commercial flight from Lima, Peru, to Mexico City, covering the 2,730 miles in 12 hr 50 min. The flight was part of a route survey preparatory to a DC-6B service later this year from Vancouver to Rio de Janeiro. To facilitate this service, the runway at Lima will be extended by 900 ft.

* * *

In our issue of June 19th Mr. F. Barltrop was incorrectly reported as saying that current legislation stipulates two years experience before a radio operator can be licensed. In fact, applicants for the Temporary Flight Radio Telegraphy Operator's Licence are not required to furnish evidence of experience. Details of the qualifications expected of applicants for the First Class Flight Radio Telegraphy Operator's Licence are set out in M.C.A.P 90 Appendix I.

Delivery of P.A.W.A.'s second batch of Douglas DC-6Bs (the first fleet of 18 aircraft was completed last October) is now proceeding at the rate of two aircraft per month. By June next year the airline expects to have a total strength of 45 DC-6Bs, together with three DC-6A Liftmasters also on order. As the new aircraft enter service Pan Am are gradually extending their low fare network throughout the world; three extra weekly flights to Europe, for example, will be made from August 1st onwards.

* * *

Loss of the port wing in flight is reported to have been the cause of the accident to a National Airlines DC-6 on February 14th. All 46 people aboard the aircraft were lost when it descended into the Gulf of Mexico while flying from Tampa, Florida to New Orleans in turbulent weather.

* * *

Hunting Air Transport which has just been admitted to full membership of I.A.T.A., is the first British independent operator to join the Association. This move will presumably facilitate Hunting's efforts to introduce Newcastle-Scandinavian services at rates which were recently opposed by I.A.T.A. as being too low.

"Flight" photograph

CHANNEL ISLANDER: An attractive addition to the fleet of Jersey Airlines is this de Havilland Heron, which operates regular services from the island to Gatwick (via Alderney) and Paris. The interior layout (left) is much appreciated by passengers, each of whom has an individual seat by a window; capacity varies from 14-17 seats, according to stage-length. Four Gipsy Queen 30 Mk 2s give the Heron 1B a cruising speed of 160 m.p.h.

OVERWORKING THE PROVOST

Intensive Flying Trials of the New Basic Trainer

Flown by South Cerney pilots, seven new Provosts pose for the camera during the intensive trials reported below.

AT South Cerney, near Cirencester, pilots of the Central Flying School (Basic) are subjecting a batch of Percival Provosts to the most gruelling treatment ever undergone by a new R.A.F. basic trainer. The object of intensive flying trials, which were introduced for all R.A.F. quantity-production aircraft some two years ago, is to spot and remedy the inevitable "bugs" which appear in any new type early in its Service career. Minor alterations or improvements can then be embodied on the production line. The trials also give the Equipment Branch a fair idea of the type and quantity of spares required. In addition, pilots who took part in the Provost trials were requested by the Air Ministry Science Branch to fill in questionnaires designed to discover any potential causes of accidents in the new type.

Phase I of the trials began with the delivery of the first Provost on May 28th—an event eagerly awaited by C.F.S. pilots. Within five days it had flown 100 hr and had doubled this figure within 11 days. By June 25th, when phase I ended, four Provosts had flown 631 hr, and at 11 a.m. on July 17th the seven aircraft then engaged in the trials reached a total of 1,000 hr.

The first phase of trials consisted of flying the aircraft at maximum intensity (one Provost flew 21 hr 5 min in one 24 hr period) while familiarizing instructors and maintenance staff with its characteristics. During this four-week period 101 pilots were converted to the type, and a visit was paid to Valley, where Provost and Vampire T.11 instructors discussed details of the proposed Provost-Vampire training sequence and flew each other's aircraft.

During the second phase, which began on June 27th and is still in progress, the rate of utilization is lower—but still well above the normal figure. The Provosts are now being used in their normal C.F.S. role in the training of experienced pilots as flying instructors. Half the students on the course are being trained on the Provost and half on the earlier and less agile Prentice. This enables instructors to assess the new aircraft's merits as a trainer and to adjust the "patter" to match its improved performance. "To date," writes an Air Ministry observer, "the Provost has performed well during the trials and the good impression given by the prototype has been confirmed. It has no 'vices' and is easy to fly, but not so easy that the inept pupil remains undetected."

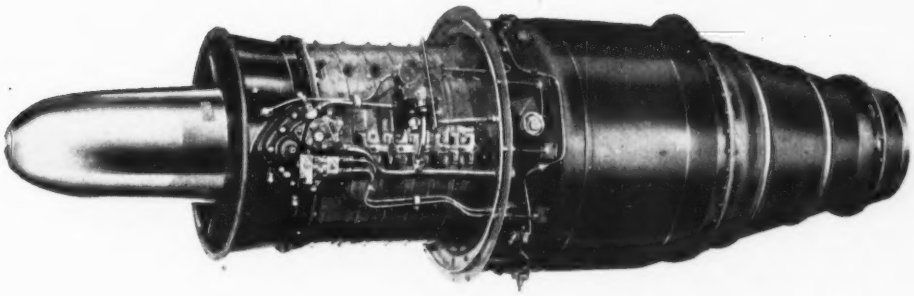
The side-by-side seating arrangement is comfortable and convenient, and cockpit layout has evoked particularly favourable comment. Several of the Provost's performance characteristics resemble those of the more powerful types which pupils will fly later in their training: in aerobatics, for example, it has much in common with the Vampire, and instructors describe the aircraft as very suitable for performing simulated jet Q.G.H.s (controlled descents through cloud). They emphasize that although pleasant and straightforward to fly, the Provost must be flown accurately, and that it shows up pupils' faults better than its predecessor. Despite its comparatively high output, the 550 h.p. Alvis Leonides is reported to be both smooth and resonably quiet.

As Provosts enter service, the R.A.F. plan to introduce a new sequence of training whereby pilots will qualify for their wings on Vampire T.11s. They will transfer direct from Provosts to Vampires instead of, as in the past, carrying out their basic training on the Prentice or Chipmunk and applied flying to "wings" standard on the Harvard, Balliol or Oxford.

Officer commanding at South Cerney, the scene of the trials, is G/C. A. H. S. Lucas. Trials began under the direction of W/C. K. J. Sewell, A.F.C., D.F.M.(C.F.I.), and W/C. A. W. Lindley (C.T.O.). W/C. Sewell has recently been posted to another unit and S/L. E. C. Gartrell, O.B.E., D.F.C., of the R.N.Z.A.F., has taken over the flying side. Pilots of several nationalities have taken part in the second phase of the trials.

(Above) Another view of the formation, this time from within. Below are some of the C.F.S. instructors and pupils who flew Provosts: (Left to right) Com. Plt. J. M. Barbour, R.N.; Capt. J. Elson, R.A.; F/L. J. A. Liversidge; and Maj. M. M. Karim, Royal Pakistan Artillery. (Centre picture) Col. H. A. Wahhab, Iraqi Air Force; F/O. F. M. Jones, R.A.F.; F/L. B. N. Byrne, R.A.F.; Capt. M. A. Pritchard. R.A. Ground staff (right) also became acquainted with the new basic trainer which is powered by a 550 h.p. Alvis Leonides.

Viper TURBOJET



The Viper turbojet is being developed in two forms,

"short life" for the Australian Jindivik pilotless target aircraft,

and "long life" for the Percival Provost, the first British ab initio Jet Trainer.

A licence agreement for the manufacture and development of the Viper

has been negotiated with Avions Marcel Dassault

of Paris, and is already in operation.

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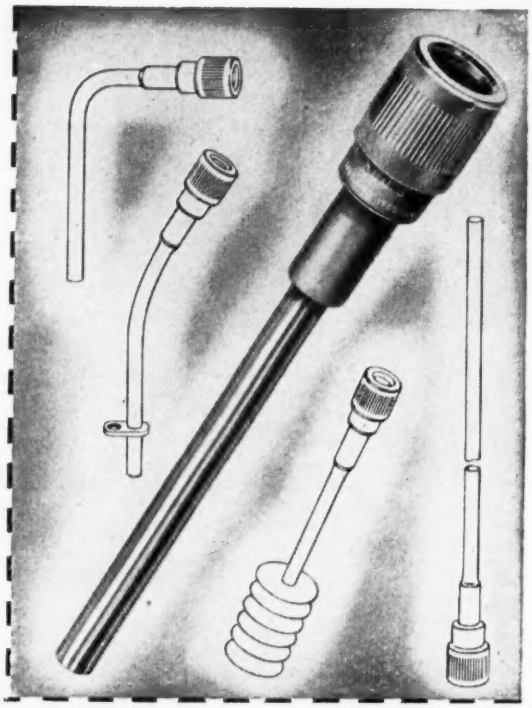

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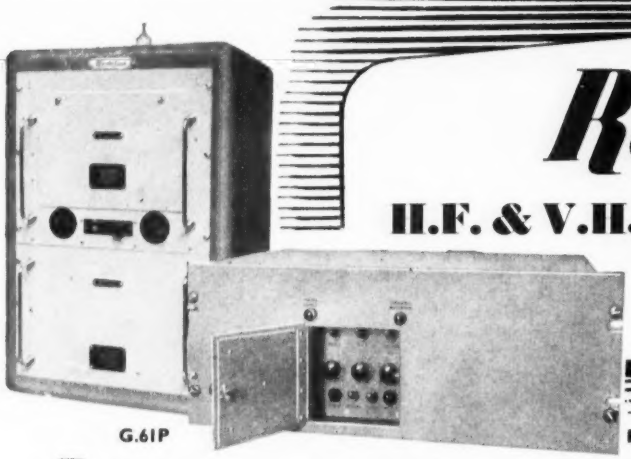

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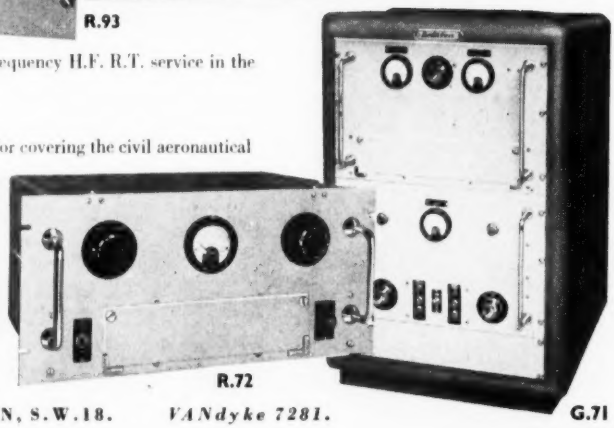
The R.93 is a fixed frequency H.F. receiver for R.T., W.T. and R.T.T. services in the 2-20 Mc/s band.

The R.72 is a fixed frequency V.H.F. R.T. receiver for the 116-132 Mc/s band.

These four equipments are widely used for ground to air services in many parts of the world.



R.72

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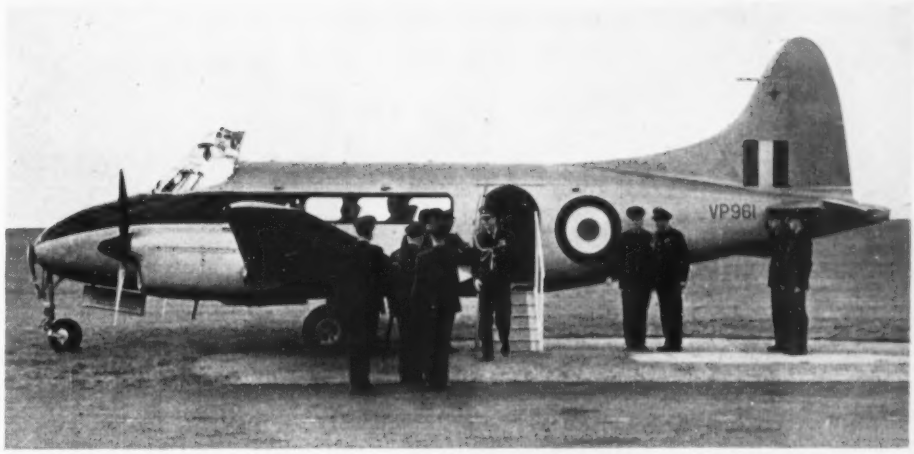
Royal Air Force and Fleet Air Arm News



THE DUKE FLIES IN: H.R.H. the Duke of Edinburgh steps down from his Devon before reviewing the passing-out parade of Cranwell cadets. (Right) respective winners of the Queen's Medal, the Sword of Honour and the Medal of Honour: (Right) F/Cdt. U/Off. Henderson, F/Cdt. U/Off. Cock and F/Cdt. U/Off. Parker.

THE DUKE OF EDINBURGH AT CRANWELL

THIS year's passing-out parade at Cranwell, on July 28th, was reviewed by Marshal of the Royal Air Force H.R.H. the Duke of Edinburgh. The parade marked the passing out of No. 59 Entry and No. 10 (Equipment and Secretarial Branch) Entry.

His Royal Highness arrived piloting his own Devon with F/L C. R. Gordon, his flying instructor, as co-pilot. On disembarking he was received by Lord de L'Isle and Dudley, **V.C.**, Secretary of State for Air; the Earl of Ancaster, Lord Lieutenant of Lincolnshire; Air Chief Marshal Sir William Dickson, the Chief of the Air Staff; Air Marshal L. F. Pendred, A.O.C.-in-C., Fighter Command; and the Commandant of the College, A.Cdre. H. Eeles.

The parade of 400 cadets was inspected by the reviewing officer and then marched past with commendable precision. After the advance in review order, the Duke of Edinburgh presented the Sword of Honour, the Queen's medal and the medal of honour to, respectively, F/Cdt. U/Off. P. G. Cock, F/Cdt. U/Off. J. M. Henderson and F/Cdt. U/Off. N. A. Parker.

Addressing the parade after the presentation, His Royal Highness referred to the 10,000 cadets who yearly join the three Services as officers, saying that each cadet thought that his own Service was primarily responsible for the defence and security of the Country. This attitude, he said, "ignores the fundamental principle that sound defence depends upon co-operation and teamwork between the three Services . . . " With seniority came the need for an understanding of this co-operation as well as for a knowledge of the political and economic factors involved in the planning of defence for the Country.

The guests at the parade included Marshals of the Royal Air Force Lord Trenchard, Lord Newall, Lord Tedder and Sir John Slessor. Also present were four former Commandants of the College and the Commandant of the U.S. Military Academy at West Point, Maj. Gen. F. A. Irving.

After the parade His Royal Highness planted a tree at the edge of the lawn now called "the Tangerine" where, until this year, the original wooden buildings of the College stood. When the remainder of the prizes and awards had been presented and the Duke of Edinburgh entertained at a luncheon in the College, the Cadets and the Royal visitor gathered on the parade ground to watch a display of formation aerobatics by four Meteor 7s from Driffield, led by F/L A. Lang.

Shortly after 3.30 His Royal Highness again took the controls of the Devon and departed, it was said, for Tangmere and Cowdray Park.

The Navy in "Momentum"

NAVAL participation in Exercise Momentum will consist of the sailing of two coastal convoys during the weekends Aug. 15th to 16th and Aug. 22nd to 23rd.

The convoys will be defended by aircraft of Fighter Command and will be subjected to attacks by the Fleet Air Arm. Six front-line and six R.N.V.R. Squadrons, comprising about 100 aircraft, will take part, including Attackers, Wyverns, Fireflies, Sea Furies and Seafires.

F/L M. E. Whitworth Jones

WE record with regret the death of another senior officer's son who has chosen the R.A.F. as his career: F/L M. E. Whitworth Jones, son of Air Marshal Sir John Whitworth Jones (who is a member of the Air Council), lost his life in an accident while flying a Venom on a rocket-firing exercise at Holbeach, on July 28.

F/L. Whitworth Jones was one of the R.A.F. pilots sent to gain operational experience in Korea. He served with No. 77 Sqn., R.A.A.F., flying 157 sorties and being awarded the D.F.C. for gallant and distinguished service.

INSPECTION: Accompanied by the Commandant of the Royal Air Force College, A. Cdre. H. Eeles, C.B.E., and the O.C. Flying Wing, W/C I. N. MacDougall, D.F.C., the Duke of Edinburgh pauses before aircraft and personnel of No. 2 Flight during his inspection of the Flying Wing.

Scottish R.N.V.R. in Malta

FOR the first time, more than one R.N.V.R. Squadron will operate from R.N.A.S. Halfar, Malta, when 14 Fireflies of the Scottish Air Division R.N.V.R. begin their annual training on August 22nd. The two squadrons, No. 1830 (Lt.Cdr. R. C. Read, R.N.V.R.) and No. 1843 (Lt.Cdr. M. Ross, R.N.V.R.), will fly to Malta from R.N.A.S. Abbotsinch, near Glasgow, and will be accompanied by two Sea Fury Trainers. Two Vikings will bring the ground personnel.

The squadrons will spend two weeks engaged in exercises with ships and submarines of the Mediterranean Fleet; many of the officers and ratings will also spend short periods afloat to gain sea experience.

Naval Wings Awarded

THE First Sea Lord, Admiral of the Fleet Sir Rhoderick McGrigor, G.C.B., D.S.O., flew from Northolt to R.A.F. station, Syerston, on July 24th, to present flying badges to junior Naval officers who have qualified as pilots.

A total of 30 lieutenants, sub-lieutenants and midshipmen have qualified for their wings on completion of their initial training, which is undertaken by the R.A.F.

SERVICE AVIATION . . .

Similar courses qualify at intervals of two months.

After the parade the First Sea Lord lunched with the Commanding Officer of the Station, G/C. W. P. J. Thomson, D.F.C., before returning to Northolt in a Naval aircraft.

Transport Training

WITH the object of increasing flying efficiency in Transport Command, a new training scheme has been put into force, under which aircraft of Hastings squadrons will be periodically detached from their United Kingdom bases to operate with overseas commands for a month at a time.

The squadrons will operate as independent units, or small task forces, designed to give aircrews greater experience of flying conditions in different parts of the world. Under the Command's numerous flying commitments every month, the Hastings transports are often engaged on individual flights on the long-range trunk routes. Now, a whole squadron is to be taken away from its normal flying tasks for two months at a time, the first month being spent on intensive transport support work in the United Kingdom, and the second overseas.

Five Hastings of No. 53 Squadron flew to R.A.F. Station, Changi, Singapore, recently, to begin a series of long-range flights, casualty evacuation duties and other tasks under the direct command of their squadron commander, S/L. B. H. Worts, and under the control of H.Q., Far East Air Force, as an integral part of the F.E.A.F. transport force. Their tasks include long-distance flights between Changi and Kai Tak (Hong Kong) *via* Saigon (French Indo-China), and between Changi and Iwakuni (Japan) *via* Saigon and Kai Tak, the latter entailing an out-and-return flight of some 5,000 miles.

On casualty evacuation work No. 53 Squadron aircraft fly from Changi, *via* the U.S. Air Force base at Clark Field, Manila, to Iwakuni, where they pick up British and United Nations casualties from Korea and fly them back to Changi. There, the casualties are transferred to Hastings aircraft sent specially from England to fly them home.

No. 53 Squadron's first task at Changi was to fly officers and airmen of a R.A.F. Regiment (Malaya) Rifle Squadron from Singapore to Kai Tak, to relieve another rifle squadron, which was then flown back to Singapore.

Two of the five aircraft flew out to Changi *via* El Adem, Sharjah, and Negombo. The other three travelled the normal R.A.F. Far East trunk route, calling at Idris, Habbaniya, Mauripur and Negombo. Each aircraft carried two aircrews who flew alternate legs of the journeys. Thus, on arrival at Changi, one crew was sufficiently rested to enable it to start its Far East training programme immediately. Thirty-eight ground crew airmen were carried in the five Hastings to service the aircraft in the Far East.

From Changi, each aircraft is required to put in 100 hours of flying during its month's attachment, and this, together with flying time to and from the Far East, should give each Hastings a total of approximately 180 hours' flying time during the month.

SOUND EQUIPMENT: Used in Malaya, this Valetta carries four high-power loudspeakers to call upon terrorists to surrender, for propaganda and to give rescue instructions (see item in col. 2.) Austers have also been equipped with loudspeakers for similar duties.

For Marksmanship

HER MAJESTY THE QUEEN has been pleased to authorize the institution of a Queen's Medal for champion shots of the Air Forces of the United Kingdom, Canada, Australia, New Zealand and Ceylon. The medal may be worn on all occasions and the ribbon is in dark crimson with three stripes at each edge, of dark, light and dark blue respectively. It will be worn immediately after the Queen's Medal.

APPROVED DESIGN: The new Queen's Medal for champion shots (See paragraph above.)

Valetta's Voice

THE employment of air-to-ground loudspeakers mounted in aircraft is not new, but from Malaya, where considerable use is being made of this form of "public address," comes some interesting news of experience with such equipment. The aircraft in this instance is a Valetta, fitted with four loudspeakers having an output of 2,000 Watts—about 40 times the power of an ordinary outdoor public-address system—and giving a range of one mile from 1,500ft, the sound being directed downwards and to port of the aircraft. Under ideal conditions 100 square miles can be covered in one hour, but cloud, wind or air turbulence reduce efficiency.

One problem which had to be overcome arose when certain particularly vigorous plosives (word-sounds of a sharp, "explosive" nature), in the Hakka dialect of Chinese, overloaded loudspeaker coils sufficiently to burn them out; but, following the necessary modifications, the equipment has proved both effective and useful. The previous practice of the anti-terrorist patrols of leaving surrender leaflets on tracks used by the terrorists was not altogether satisfactory, because a terrorist who valued his life would not be seen reading one by his comrades. The loudspeaker approach, on the other hand, avoids the risk to the terrorist and yet is more likely to reach him. Tangible results, in the form of surrenders, have been good.

Another use for the "voice aircraft," as the Valetta is called, is in assisting aircrew who have baled out over the jungle to make contact with rescue parties. A Vampire pilot was recently assisted in this way to make contact with the rescuing patrol.

Half-yearly Promotions

(*continued from page 156 last week*)

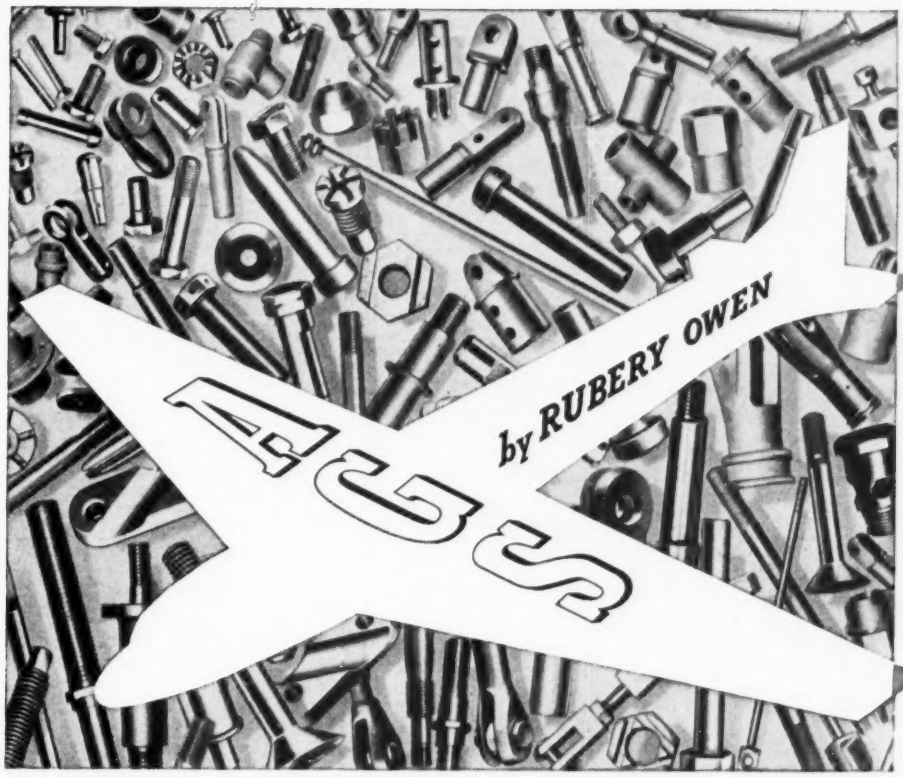
EQUIPMENT BRANCH. *Air Commodore to Air Vice-Marshal.*—H. D. Jackman, C.B., C.B.E. (Act. A.V-M.), A.O.C. No. 40 Group, Maintenance Command. *Wing Commander to Group Captain.*—P. H. Stibbs. *Squadron Leader to Wing Commander.*—P. A. B. Neel, D. Tollerton, A. L. Cornford, A. W. G. Stuart, F. H. Kelly, M.B.E., W. C. Hill, T. R. F. Handcock and R. D. Stephens. *Flight Lieutenant to Squadron Leader.*—J. J. Walsh, R. A. Milsom, F. G. G. Schofield, D. H. Luck, D.F.C., R. Watt, G. B. Latymer, J. E. Dew-Parry, J. W. Edwards, S. W. Wilding, L. G. W. Lilly, K. Taylor, D.F.C., E. J. White, D.F.M., J. C. Davies, R. E. West, C. Martindale, S. A. Armstrong, H. S. Tardrew, R. V. Derbyshire, H. C. E. Weekes, J. Stevenson, J. J. H. Harding, B.E.M., E. Lindon, S. J. Andrews, J. C. Harris-Ward, D.F.C., F. E. Brierley, A. G. Wright, D.F.C., H. C. McFarlane, J. R. Stowe, W. J. C. Powell, P. Smith, J. M. Forbes and H. D. Elmes. *Flight Officer to Squadron Officer, W.R.A.F.*—J. E. Mattock.

SECRETARIAL BRANCH. *Group Captain to Air Commodore.*—B. L. Blofield, C.B.E. *Wing Commander to Group Captain.*—J. G. Wigley, R. F. Fleming, D. L. J. Rowe, O.B.E., W. F. Lamb, O.B.E. and G. L. Seabrook. *Squadron Leader to Wing Commander.*—H. C. Fleming, E. F. Nind, D.F.C., H. C. Smith, A.F.C., D.F.M., A. T. Arnold, W. J. Wintet, D.F.C., F. E. Ratcliffe, O.B.E., H. A. F. Summers, M.B.E., E. P. Appleton, L. T. Starling, H. E. Kelsey, C. N. McLoughlin and E. M. Webb. *Flight Lieutenant to Squadron Leader.*—J. Atkinson, J. S. Findlay, A. C. Philip, K. J. W. Josling, E. J. McDonald, D. G. Hall, D.F.C., G. T. Williams, O.B.E., D.F.M., G. E. Goodchild, M.B.E., T. Stafford, A. H. D. Pond, A.F.C., C. P. Webb, A. M. Campbell, G. A. Harrison, K. C. Lounds, M.B.E., W. M. Jamieson, M.B.E., B. D. Shaw, R. G. Jebb, R. D. Sheardown, O.B.E., F. S. Tippett, J. R. Simpson, J. Robinson, F. S. Wright, J. H Elshaw, A.F.C., D.F.M., M. Williams, P. M. Sheridan, D. V. T. Richards, M.B.E., G. S. Haines, R. J. Reynolds, D.F.C., D.F.M., W. S. Lloyd, J. Howell, W. S. Tagg and A. B. Smith. *Flight Officer to Squadron Officer, W.R.A.F.*—C. M. Morgan, B. M. Jones, P. F. Marshall, E. P. L. Meyer, H. E. M. Johnson and A. Penfold, M.B.E.

MEDICAL BRANCH. *Air Vice-Marshal to Air Marshal.*—J. MacC. Kilpatrick, K.B.E., C.B., M.B., B.Ch., D.P.H., Q.H.P. (Act. Air Marshal), Director General of Medical Services. *Air Commodore to Air Vice-Marshal.*—R. H. Stanbridge, O.B.E., M.R.C.S., L.R.C.P., D.P.M., D.I.H., Q.H.P. (Act. A.V-M.), Principal Medical Officer, M.E.A.F. *Group Captain to Air Commodore.*—G. W. McAleer, M.B., Ch.B., D.T.M. and N. *Wing Commander to Group Captain.*—A. M. Weston, M.B., B.Ch., M.R.C.S., L.R.C.P. *Squadron Leader to Wing Commander.*—J. J. McNair, M.B., Ch.B., D.P.H., F. N. Shuttleworth, M.B., Ch.B., D.C.M.S., G. H. Drenin, G.M., M.B., Ch.B., M.R.C.S., L.R.C.P., T. J. G. Price, M.R.C.S., L.R.C.P., D.C.M.S., and J. E. Malcolm, B.Sc., M.B., Ch.B., F.R.C.S., L.R.C.P.

FIGHTER CONTROL BRANCH. *Squadron Leader to Wing Commander.*—G. E. Morris. *Flight Lieutenant to Squadron Leader.*—H. R. Barrand, S. H. Brown, M.B.E., R. H. J. Brailsford and D. R. Wilson.

AIRCRAFT CONTROL BRANCH. *Flight Lieutenant to Squadron Leader.*—G. McPherson, A.F.M., R. G. Woodcraft, A.F.C., E. P. Eastment, A.F.C. and G. H. M. Nichols.



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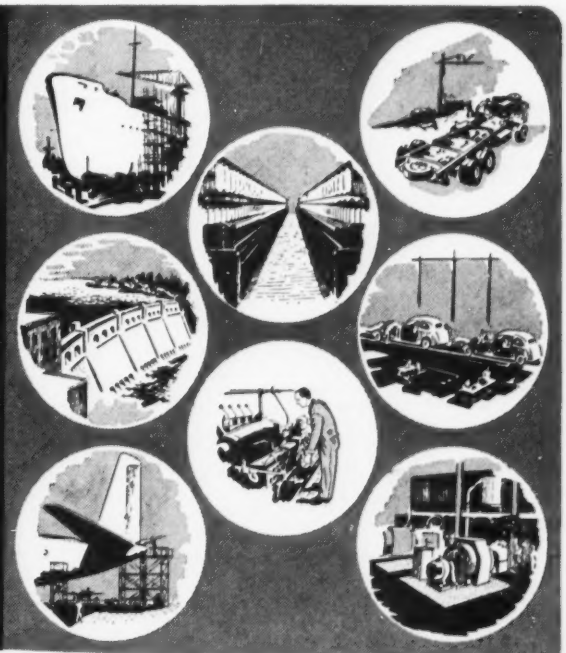

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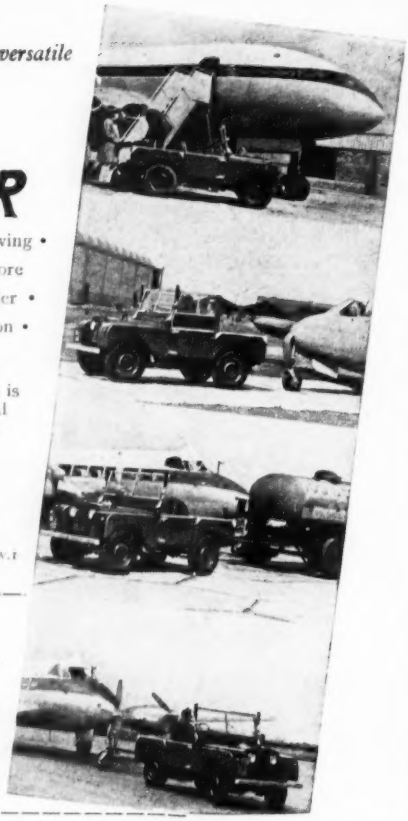

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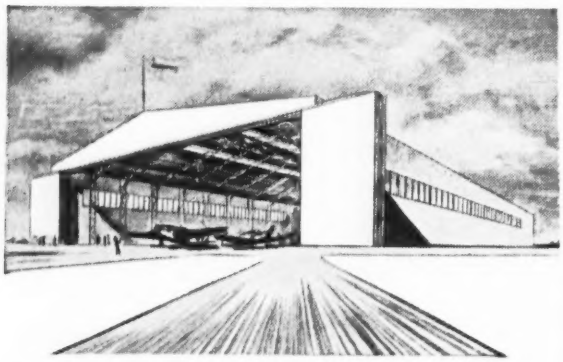

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(21 years at this address and 128 types of aircraft sold)

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Cables: Aeropaul, Croydon.
[0940

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K.
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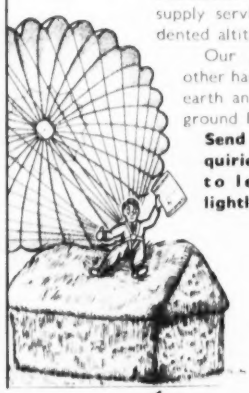

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PATENTS

THE proprietor of British Patent No. 636497, entitled "Screw propeller blade," offers same for licence or otherwise to ensure practical working in Great Britain.—Inquiries to Singer, Stern & Carlberg, 14 East Jackson Boulevard, Chicago 4, Illinois, U.S.A. [9910

THE proprietor of British Patent Nos. 623634 and 623633, entitled "Improvements in and method of making insulating pads" and "Insulating pads," respectively, offers same for licence or otherwise to ensure practical working in Great Britain.—Inquiries to Singer, Stern & Carlberg, 14 East Jackson Boulevard, Chicago 4, Illinois, U.S.A. [9909

PUBLIC ANNOUNCEMENTS

AIR TRANSPORT ADVISORY COUNCIL

THE Air Transport Advisory Council give notice that they have received the undermentioned applications to operate scheduled air services:—

Application No. 206 from Flightways, Ltd., of Southampton Airport, Eastleigh, Hants, for a U.K. internal service with DH89 aircraft for the carriage of passengers, supplementary freight and mail between Southampton (Eastleigh) and Alderney (C.I.), at a frequency of from two to 16 services daily in summer and three services weekly in winter during the period from January 1, 1954, to December 31, 1963.

From East Anglian Flying Services, Ltd., of Southend Airport, Southend-on-Sea, Essex:—

Application No. 207 for a normal scheduled service, initially with DH89 aircraft and later with Avro 19 or Dakota aircraft and possibly DH Heron aircraft, for the carriage of passengers, supplementary freight and mail between Ipswich and Calais with intermediate traffic stops at Southend and Lympne, at a frequency of up to 10 services daily with duplication as required during the period from April 1st, 1954, to March 31, 1964.

Application No. 208 for a normal scheduled service, initially with DH89 aircraft and later with Avro 19 or Dakota aircraft and possibly DH Heron aircraft, for the carriage of passengers, supplementary freight and mail between Southend and Antwerp, with intermediate traffic stops at Ipswich and Ypenburg, at a frequency of up to four services daily, with duplication as required, during the period from April 1, 1954, to March 31, 1964.

THESE applications will be considered by the council under the terms of reference issued to them by the Minister of Civil Aviation on July 30th, 1952. Any representations or objections with regard to these applications must be made in writing, stating the reasons, and must reach the council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 9 Buckingham Gate, London S.W.1, from whom further details of the applications may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the council, must reach them within the period allowed for the making of representations or objections. [9923

TIME RECORDERS

STAFF item checking and job-casting time recorders (all makes) for quick cash sale; exceptional condition. —Box 7241. [0040

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GEMINI aircraft, fitted radio, £6 per hour, dual or solo.—Southend Flying School, Essex. Rochford 56204. [0333

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have for sale the remainder of their fleet of Hermes IV aircraft. They are fitted with Hercules 763 engines which are capable of modification for operation on 100 grade octane fuel.

The aircraft have been maintained to the highest B.O.A.C. standard and are in fully operational condition.

Any reasonable offer will be considered. Full stock of spares including engines and propellers is available.

For further particulars apply to Supplies Controller (General), B.O.A.C., Airways House, Great West Road, Brentford, Middlesex. Telephone: EALing 7777. Ext. 339.

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SOUTHEND-ON-SEA MUNICIPAL FLYING SCHOOL, Essex. Phone: Rochford 56204. Comprehensive training for private, commercial licences and instructor's endorsements. M.C.A. approved for 30-hour course. Tiger Moth and Auster aircraft. Special facilities for training in instrument ratings and radio procedure. Hourly rates: Solo £3, dual £3/5/-, contract rate £2/10/-. No entrance fee or subscription. Trial lesson 30/-. [0332

WORK WANTED

KELLERING and profile milling in all metals—send us your die blocks to copy from wood or plaster masters. Ten days' delivery service. We are die-copiers to the trade.—Armytage Bros. (Knottingley) Ltd., The Foundry, Knottingley, Yorkshire. Tel.: Knottingley 46. [0975

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The engagement of persons answering these advertisements must be made through the local office of the Ministry of Labour and National Service, etc., if the applicant is a man aged 18-64 or a woman aged 18-59 inclusive, unless he or she or the employer is excepted from the provision of The Notification of Vacancies Order 1952.

GUIDED MISSILE RESEARCH AND DEVELOPMENT

DEVELOPMENT engineers required on guided missile hydro-mechanical devices with particular reference to control mechanisms. Laboratory assistants also required as testers for hydraulic pumps, motors, etc. —Apply in confidence to Box AC82565, Samson Clarks, 57-61 Mortimer Street, W.1. [0933

THE COLLEGE OF AERONAUTICS.

A TECHNICAL photographer will shortly be required by the College of Aeronautics. Opportunity for young man with sound technical training to widen experience in scientific work. Institutional or C. and G. certificates desirable. Salary range £410 to £540.—Further particulars and application form available from Recorder, The College of Aeronautics, Cranfield, Bletchley, Bucks. [9914

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RESEARCH assistant required in the Department of Flight. Good scientific background and sound knowledge of aerodynamics essential. Experience of flight research desirable. Successful applicant to assist in expanding programme of full-scale aerodynamic research. Salary £400 to £600 p.a. according to qualifications and experience. Single accommodation available.—Applications to Recorder, The College of Aeronautics, Cranfield, Bletchley, Bucks. [9924

AIRCRAFT fitter/riggers for wooden/metal aircraft. Good wages and prospects.

AIR NAVIGATION, Ltd., Blackpool Airport. [9915

ENGINEER required for Lockheed 12A to operate Middle East. Preferably knowledge radio. Full details.—Apply Box 8737. [9904

AIRCRAFT radio engineers and mechanics required for employment at London Airport. Licensed personnel preferred, but not essential.—Please forward full details of age, experience, etc., to Box 8760. [9913

BROOKLANDS AVIATION LTD. require senior works inspector with experience on jet aircraft. Applications in writing to No. 2 Site, Buttocks Booth, Moulton, Northants. [9886

RADIO engineer required for responsible position by Cambrian Air Services, Ltd., Cardiff Airport. Must hold "A" licence. Salary in scale £600-£700 per annum, according to qualifications.

APPLY: Chief Engineer. [9916

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AERO-ENGINE inspectors required by Field's of Croydon Airport. Good knowledge of piston engines essential; Pratt and Whitney experience desirable. Sports and canteen facilities.—Apply to Personnel Officer, or telephone Croydon 7777. [9888

TECHNICAL illustrator required, aged 23 or over, with considerable practical experience.—Applications in writing to Personnel Manager, Percival Aircraft, Ltd., Luton Airport, Beds, stating age, experience and salary required. [0593

SKYWAYS of London have a limited number of vacancies for Pilots with A.L.T.P. Licence and York or other multi-engine experience.—Write or phone Personnel Manager, 7 Berkeley St., W.1. Tel.: GRO 7721. [0291

SENIOR and intermediate design draughtsmen with good experience of aircraft or light structural or mechanical engineering, required for aircraft and armament project work.—Apply by letter to Portsmouth Aviation, Ltd., The Airport, Portsmouth. [9631

STRESSMEN, all grades. Salary range £900-£500 per annum, depending on experience and qualifications. Senior men particularly required.—Please send full particulars to Box AC80348, Samson Clarks, 57/61, Mortimer Street, W.1. [0931

LICENSED radio engineer and radio mechanics at our base at Stansted Airport, Essex.—Apply by letter or telephone to the Senior Radio Engineer, Aviation Traders, Ltd., Southend Airport, Essex. Tel.: Rochford 54491. [0950

TEST engineer required, preferably with experience in fuel components and systems. Qualifications: H.N.C. or equivalent.—Apply, in writing, to Personnel Manager, Flight Refuelling Ltd., Tarrant Rushton Airfield, nr. Blandford, Dorset. [9898

AIRCRAFT radio mechanics skilled in workshop practice or aircraft installations to work at Stansted Airport, Essex. Hostel accommodation available. Minimum hourly rates, 3s. 9d.—Write to the Personnel Manager, Skyways of London, 7 Berkeley Street, W.1. [0290

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AIRCRAFT engineers, licensed in categories "A" and "C" for Viking aircraft, also "A" and/or "C" Dakota aircraft, are required for Bovingdon Airport base. Good pay and pleasant working conditions.—Apply in writing to P/O, Field Aircraft Services, Ltd., Croydon Airport, Surrey. [9889

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TECHNICAL sales clerk required London area. Sound knowledge of business office correspondence and administration. Some experience engineering workshop or D.O. desirable (aviation preferred). Age not exceeding 35 years.—State qualifications, experiences and salary expected, Box 8799. [9921

PRODUCTION control manager (age 30-35) required by progressive light engineering company in North London. Applicants must have had at least five years experience in a similar capacity in charge of planning, progress, purchasing, etc., and preferably have some knowledge of export and import procedure. Practical engineering and production background necessary with experience in modern job, batch and mass production methods. Must be thoroughly conversant with modern management practices and administration, and possess initiative, drive and the ability to get things done. Staff pension scheme and good salary plus bonus. excellent housing prospects.—Apply, stating age, experience and particulars of qualifications in chronological order, Box 8703. [9896

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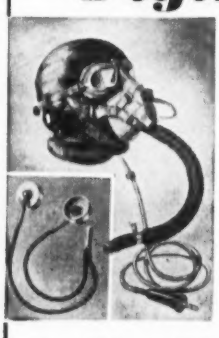

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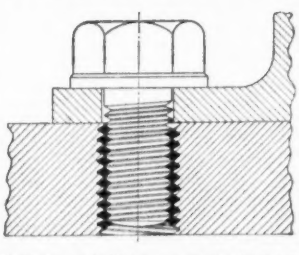

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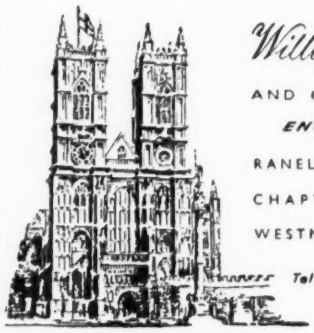

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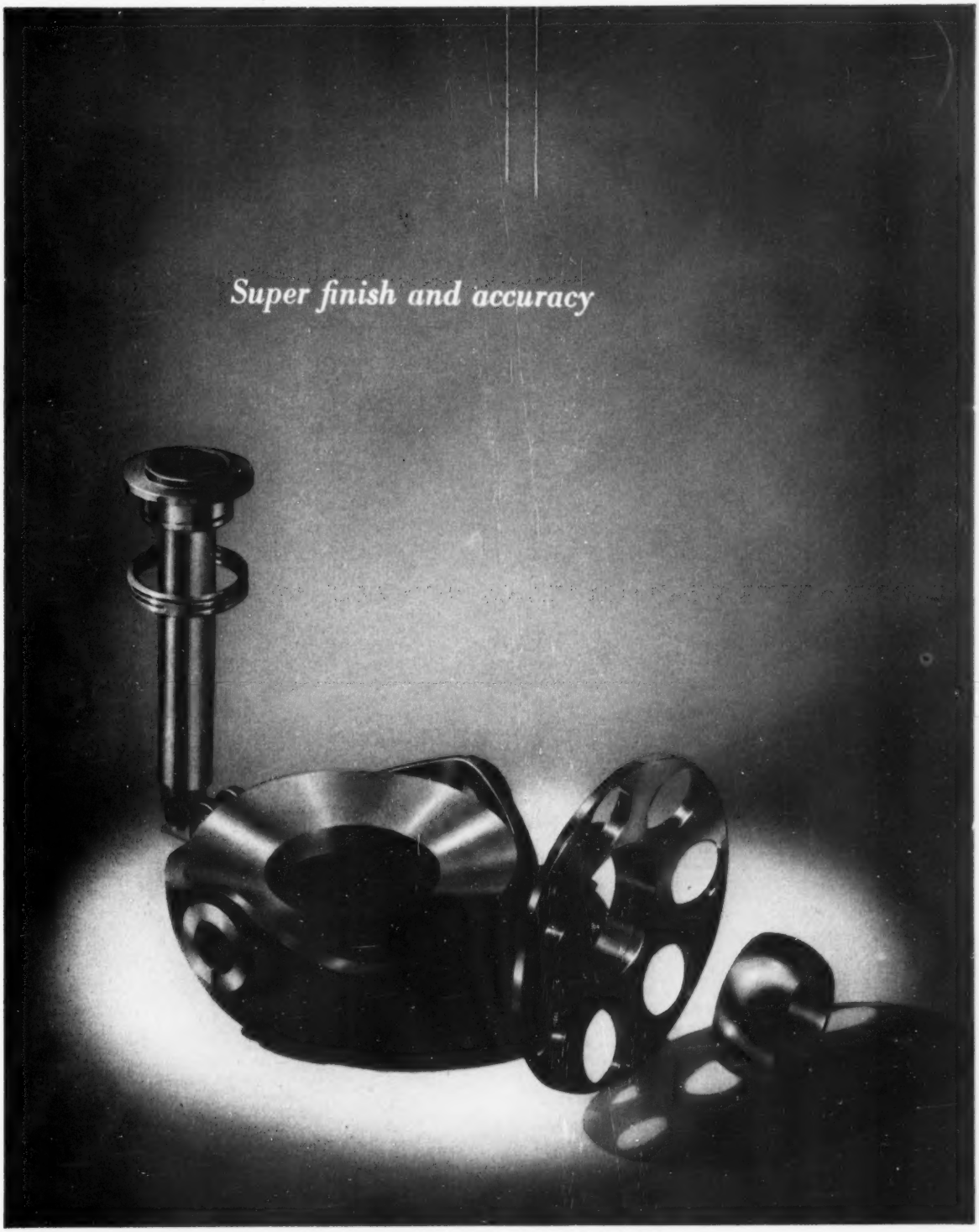

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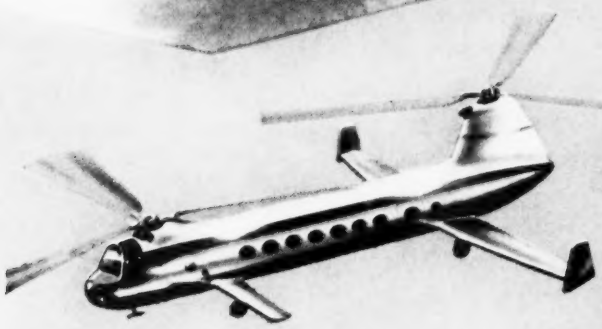

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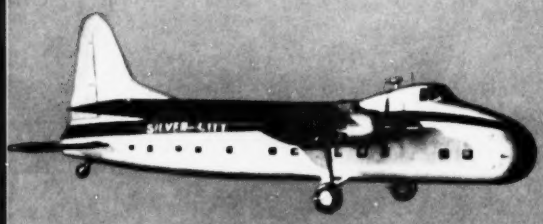

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